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Child Behavior, Animal Behavior,
and Comparative Psychology

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The Journal of Psychology

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A STUDY OF THE SUBTESTS IN THE REVISED STANFORD-BINET SCALE, FORMS *L* AND *M**¹

The Merrill-Palmer School

VIRGINIA VAN DYNE FLEMING

A. INTRODUCTION

While supervising the testing program of the Merrill-Palmer School, the writer was impressed by the seeming difference in difficulty of the subtests within the different year levels of both forms of the Revised Stanford-Binet Scale. In discussing tests which they had given, some students mentioned this observation, tending to keep it in mind, almost as if it were an established fact, in their test interpretations; others spoke of the apparent differences in difficulty, but were unaware of the difference in interpretation that might follow if the subtests were found to lack uniformity in difficulty; while some made no mention of such an observation.

The writer, who tries to be cognizant of all factors entering into the qualitative evaluation of tests, felt that this experiential observation concerning subtests within given year levels of the Revised Stanford-Binet Scale justified systematic investigation.

Individual performances on all Form *L* and Form *M* tests given by Merrill-Palmer students from 1937 to 1941 were therefore recorded, and for each test were tabulated the *CA* (chronological age), *MA* (mental age), *IQ* (intelligence quotient), tester, school or other source of the testee (source), a plus for each test taken and passed, and a minus for each test taken and failed.

In this way 210 Form *L* performances were tabulated. The tests were given by 16 graduate students in mental testing, to 210 different testees from 15 sources [10 public schools, including some *WPA* nursery schools, two Sunday Schools, two settlements, and one Merrill-Palmer recreational club (one case)].

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¹The writer wishes to thank Dr. Annette L. Gillette for her coöperation; Rachel Kestenber, research assistant at Merrill-Palmer, and Dorothy Ransom of the Detroit Counseling Service for their thinking and calculating in connection with the study; Dr. E. Lee Vincent chairman of the Research Committee at Merrill-Palmer for her criticism and encouragement; Dr. Russell C. Smart of Merrill-Palmer for advice on statistics and interpretation; and Dorothy Tyler head of publications at Merrill-Palmer for editing the manuscript.

Similarly, performances of 118 children on Form *M* were recorded. These tests were given by 10 graduate students in mental testing, to children from 13 sources (ten public schools, including *WPA* nursery schools, two settlements, one Sunday School).

Between the forms there was no overlapping in testers, probably less than five cases in testees, and eight instances in sources.

The writer is well aware of the relation of test reliability to tester reliability, and therefore feels it necessary to describe the training of these 26 graduate student testers. Each tester learned the test to the point of having memorized all instructions. She used the manual only as a periodic check on herself and as an aid if her memory failed her, but was instructed always to use the manual when she was not absolutely sure of herself. The tester then gave the entire test to the writer. If this test was adequately given the student then went to the various sources of testees and gave 10 tests. After the tester had given and scored each test the writer rescored it and went over any changes with the tester (test responses had been recorded verbatim). Then the tester wrote the report (interpretation) of the test, using her experience and reading in the entire field of child development as a background. The interpretation was discussed in detail with the supervisor (writer). The student tester gave her eleventh test to a child while the supervisor observed, and her technique and findings were then thoroughly discussed. Finally, the tester gave four additional, unobserved tests, the scoring and interpretation of which were handled as explained above. Class discussions of mental testing accompanied the entire program of testing and individual conferences.

Teachers assigning the testees were instructed to select non-problem and supposedly average children. In general, the testees were probably from below average socio-economic backgrounds.

TABLE 1
GENERAL DATA CONCERNING THE CASES USED^a

		<i>CA</i>	<i>MA</i>	<i>IQ</i>
Form <i>L</i> (<i>N</i> = 210)	Range	2-6 to 12-5	2-9 to 14-8	62-154
	Mean	6-8	6-10	102
	Sigma	1-8.8	2- 0	18.4
Form <i>M</i> (<i>N</i> = 118)	Range	2-6 to 10-5	2-6 to 10-11	70-154
	Mean	5-11	6-0	101
	Sigma	1-7.6	1-8.2	14.7

^aThroughout this report *MA*'s and *CA*'s are reported in terms of years and months. For example 2-6 is two years six months; 1-8.8 is one year eight and eight-tenths months.

Table 1 gives information concerning the number of cases, and their *CA*, *MA*, and *IQ*.

In both forms the distribution of *CA* was positively skewed, but more in Form *L* than in Form *M*. The *MA* distributions were also positively skewed. In both forms the mean *IQ* and the *SD* of the *IQ* distribution were about the same as in Terman and Merrill's standardization group.

B. PLAN OF THE STUDY

A somewhat coarse analysis of the performances of the testees on both forms of the Revised Stanford-Binet Test was first undertaken. The results were compared with those of Mrs. Elsa Barber (1), in so far as they could be obtained. This analysis indicated that the method of study might be refined.

In the second phase of the study Dr. Annette L. Gillette's (3) method was applied to the Merrill-Palmer data. Attention was focused upon method, rather than upon the application of a single method to all data. Experimentation with variations in her method led to the formulation of a third and final method of analysis.

This third method was then applied in detail to the subtests of Form *L*. Form *M* was not included in the final phase of the study, for reasons pointed out in the description of that part. The third phase, then, was the application of the evolved method of analysis to the data. Emphasis was equally distributed between methodology and findings.

A list of the names and numbers of the subtests is given at the end of the study.

C. FIRST PHASE OF THE STUDY: COMPARISON WITH THE BARBER STUDY

In studying the relative difficulty of the subtests of Form *L*, in 1938, Mrs. Barber tabulated the successes and failures of each testee who took each subtest, and then computed the percentage of +'s for each subtest. Her subjects were 230 cases, more of them boys than girls, and most of them white, chosen at random at the Institute for Juvenile Research, Chicago. Her subjects ranged in age from 2 years 6 months to 18 years (average *CA*, 11 years 5 months). Their average *MA* was 8 years 9 months, and the range was from 2 years 5 months to 24 years 5 months.

Comparison of the *CA*, *MA*, and *IQ* data for Barber's group and for *M-P* Form *L* group shows that the average *CA* of the *M-P* group is about 5 years less, the average *MA* about 2 years less, and consequently that the

average *IQ* is higher. Undoubtedly there is also a difference in the overt problem behavior of the individuals of the two groups.

1. *Form L*

In Table 2 are presented the data and results for the *M-P* group. Data for tests taken by fewer than 20 subjects are omitted; hence there are no tabulated data for year levels II, II-6, XIV, and above.

In this table the fact that at several age levels there are many more cases for one subtest than for the other five is accounted for by the repetition at various age levels of a few tests which, when they are passed at one level, are in effect passed also at the lower age level.

Inasmuch as the writer found it impossible to obtain a complete copy of Barber's findings, only 16 of her percentages could be included in the table. For these 16 tests the rank difference correlation between her and our percentages is only .22, with a probable error of .16. In other words, the correlation is insignificant and unreliable.

The difficulty of finding the significance of the difference between subtests from the figures in Table 1 is evident when it is realized that the number of cases on which the percentages are based varies widely, and that even within a year level not each subtest was taken by entirely the same subjects. For example, in a few cases the alternate test was used for a subject, or a test was erroneously omitted, or, as noted above, when a test was repeated at two year levels the results were considered in both levels, although each person who took it at the higher level did not take all the other five subtests at the lower level. According to Terman and Merrill's instructions, Subtest X-3 is given only to children who have had two or three years of schooling, or who are at least 10 years old. Therefore, there is variation in the number of cases within the subtests of year level X.

Friedline and Berman (2) studied these *Form L* subtests with reference to clarity of expression, adaptability, and practicality. In the summary below, their comments are included along with the present writer's comments on the Merrill-Palmer and the Barber findings. In the case of the Merrill-Palmer data, only differences of at least 20 per cent are discussed.

a. Findings for Form L.

Year level III: No outstanding differences in percentages for the *M-P* group. Friedline and Berman found Tests 1, 3, and 5 to be deficient in one or more of the three factors they studied.

TABLE 2

FORM L NUMBER OF CASES TAKING EACH SUBTEST, PERCENTAGE OF CASES PASSING EACH SUBTEST (MERRILL-PALMER DATA), COMPARATIVE FIGURES FROM BARBER STUDY

Year level	Subtest	N	+ 's (%)	Year level	Subtest	N	+ 's (%)	Barber's + 's (%)
III	1	26	100	VII	1	169	56	72
	2	55	95		2	166	46	48
	3	27	93		3	168	45	
	4	27	85		4	167	52	
	5	26	88		5	168	40	
	6	27	89		6	168	58	
III-6	1	36	72	VIII	1	160	43	69
	2	55	78		2	156	58	
	3	35	69		3	156	30	
	4	35	86		4	154	36	42
	5	35	91		5	154	46	
	6	36	78		6	156	42	
IV	1	115	34	IX	1	112	50	
	2	56	80		2	120	26	35
	3	105	86		3	124	41	42
	4	55	67		4	123	35	
	5	55	78		5	123	30	62
	6	53	60		6	122	25	
IV-6	1	82	83	X	1	148	88	
	2	81	77		2	87	48	59
	3	156	90		3	12	75	35
	4	82	57		4	86	27	35
	5	82	76		5	85	41	
	6	142	85		6	86	45	
V	1	112	63	XI	1	67	34	
	2	111	87		2	67	12	27
	3	111	84		3	68	12	
	4	109	70		4	67	40	45
	5	111	64		5	67	19	
	6	113	75		6	67	25	
VI	1	184	76	XII	1	49	10	
	2	157	58		2	47	22	
	3	157	68		3	48	15	
	4	155	63		4	47	17	
	5	157	69		5	48	15	54
	6	157	61		6	44	68	20
				XIII	1	24	33	
					2	25	48	
					3	25	28	
					4	25	36	
					5	23	13	
					6	24	38	

III-6: Difference of 22 in the *M-P* percentage of cases passing Subtest 3 and Subtest 5 (69% and 91%, respectively).

IV: While only 34 per cent of the *M-P* cases passed Subtest 1, the next lowest percentage is 60, for Subtest 6. And 86 per cent passed Subtest 3. Thus, there is a difference of 52 per cent between Subtests 1 and 3.

IV-6: *M-P* percentages vary from 57 for Subtest 4 to 90 for Subtest 3, a difference of 33 per cent. The next lowest percentage is 76 for Subtest 5. Friedline considered Subtests 3, 5, 6 to be defective.

V: The largest difference in the *M-P* data is between Subtests 1 (63%) and 2 (87%), a difference of 24 per cent. Subtests in this level fall into three pairs: 1 and 5 seem most difficult, 2 and 3 easiest, while 4 and 6 fall in between. Friedline lists Subtest 4.

VI: Homogeneous in the *M-P* data, with percentages ranging from 58 for Subtest 2 to 65 for Subtest 1. Friedline lists Subtest 6.

VII: Fairly homogeneous percentages for *M-P* group, with the largest difference between 5 (40%) and Subtest 6 (58%). Barber found a greater difference in this level, the difference between Subtests 1 (72%) and 2 (48%). Friedline found Subtest 3 to be deficient in one or more aspects which she studied.

VIII: The largest difference for the *M-P* group was between Subtests 3 (30%) and 2 (58%). There was also a low percentage, 36, of successes on Subtest 4. Barber found a difference of 27 per cent between Subtests 4 and 1, the latter being easier. Friedline lists Item 4. All three studies here converge on Subtest 4.

IX: Percentages range only from 25 (Subtest 6) to 50 (Subtest 1). Friedline lists Subtest 1, and Barber's findings are not in complete agreement with those of the *M-P* data.

X: There is a large difference in percentage of successes between Subtests 4 (27) and 1 (88), a difference of 61 per cent! In fact, Subtest 4 differs from all other subtests at this level by at least 14 per cent. And Subtest 1 has a higher percentage of successes than all the other subtests, the difference between it and each other subtest being never less than 13. At this level the subtests fall again into three groups, with Subtest 4 standing alone as the most difficult item, while Items 2, 5, and 6 are fairly similar in difficulty, and Subtests 1 and 3 appear to be the easiest. Barber also found differences at this level, although hers are less than those of the *M-P* data, and not always in the same direction.

XI: Though these *M-P* percentages are low, this fact may be understood in the light of the *MA* data for the group. As for differences in subtests,

TABLE 3

FORM M. NUMBER OF CASES TAKING EACH SUBTEST, PERCENTAGE OF CASES PASSING EACH SUBTEST

Year level	Subtest	N	+'s (%)	Year level	Subtest	N	+'s (%)
III	1	26	100	IX	1	112	50
	2	55	95		2	120	26
	3	27	93		3	124	41
	4	27	85		4	123	35
	5	26	88		5	123	30
	6	27	89		6	122	25
III-6	1	36	72	X	1	148	88
	2	55	78		2	87	48
	3	35	69		3	12	75
	4	35	86		4	86	27
	5	35	91		5	85	41
	6	36	78		6	86	45
IV	1	115	34	XI	1	67	34
	2	56	80		2	67	12
	3	105	86		3	68	12
	4	55	67		4	67	40
	5	55	78		5	67	19
	6	53	60		6	67	25
IV-6	1	82	83	XII	1	49	10
	2	81	77		2	47	22
	3	156	90		3	48	15
	4	82	57		4	47	17
	5	82	76		5	48	15
	6	142	85		6	44	68
V	1	112	63	XIII	1	24	33
	2	111	87		2	25	48
	3	111	84		3	25	28
	4	109	70		4	25	36
	5	111	64		5	23	13
	6	113	75		6	24	38
VI	1	184	76				
	2	157	58				
	3	157	68				
	4	155	63				
	5	157	69				
	6	157	61				
VII	1	169	56				
	2	166	46				
	3	168	45				
	4	167	52				
	5	168	40				
	6	168	58				
VIII	1	160	43				
	2	156	58				
	3	156	30				
	4	154	36				
	5	154	46				
	6	156	42				

Items 2 and 3 were passed by only 12 per cent of the cases, while Subtest 1 was passed by 34 per cent and Subtest 4 by 40 per cent. Barber's findings as to high and low test difficulty at this level are in fairly close agreement. Friedline calls our attention to Item 5.

XII: Subtest 6 is outstandingly easy as compared with the other subtests at this level. It was passed by 68 per cent of those taking it. The next highest percentage is but 22, for Subtest 2. Barber's figures are in disagreement at this level, in so far as we have them.

XIII: Subtest 5 is definitely difficult; it was passed by only 13 per cent of those taking it. All other five subtests were passed by from 28 to 48 per cent. Friedline lists as deficient Subtests 1, 3, and 6.

2. *Form M*

The Merrill-Palmer data for Form *M* were analyzed in exactly the same manner as for Form *L*. The results are found in Table 3.

a. *Findings for Form M*. In examining Table 3, attention, as in Form *L*, should be focused upon differences in percentages within a year level, and not between year levels. The table yields the following findings:

Year level III: These subtests were homogeneous as to difficulty.

III-6: The greatest differences is between Subtests 3 (69%) and 5 (91%).

IV: Subtest 1, passed by only 34 per cent of the group, is outstandingly difficult. The next most difficult test, Subtest 6, was passed by 60 per cent, but even so is definitely harder than the two easiest subtests, Items 2 and 3.

IV-6: Here Subtest 4 is fairly difficult; it is passed by 57 per cent of the cases. The other five subtests are much less difficult.

V: Differences at this level are less marked. The greatest difference is between Subtests 1 and 5 (63% and 64%, respectively) and Item 2 (87%), although Item 3 is about as easy as Item 2.

VI: Homogeneous as to difficulty.

VII: Homogeneous.

VIII: Subtest 2 is noticeably easier than the other subtests. It is passed by 58 per cent of the cases, whereas the next easiest subtest, 5, is passed by 46 per cent of the cases.

IX: Item 1 is outstandingly easy.

X: Great differences in difficulty. Subtest 4 is passed by only 27 per cent of the testees taking it; Subtests 2, 5, and 6 occupy a middle position and are passed by more than 40 per cent; Items 1 and 3, passed by 88 per cent and 75 per cent of the cases, are much easier.

XI: Items 1 and 4 are easier than the others.

XII: Item 6 is outstandingly easy. It is passed by 46 per cent more of the cases who took it than is the next easiest item.

XIII: Subtest 5 is somewhat more difficult than the other items.

3. *Summary (First Phase)*

The plus or minus score of each of 210 children taking Form *L* of the Revised Stanford-Binet Test, and of 118 children taking Form *M*, was recorded. The percentage of +’s was then computed for each subtest in both forms, using the number of cases actually taking each subtest as the basis. These results give a rough estimate of the comparative difficulty of the subtests within each age level of each Form, but do not permit comparisons between age levels, or between forms. The results are compared with those of Barber.

4. *Conclusions (First Phase)*

1. In both forms there are several age levels within which the subtests seem to be of unequal difficulty.

2. Few of Barber’s results were obtainable, but a comparison of those available with the results of this study shows little agreement, except that both studies find the subtests to differ in difficulty, though there is disagreement in direction and as to which items differ.

3. A better method of analysis should be sought in order to answer the original question, viz., are the subtests within each age level of each form of the Revised Stanford-Binet Test of equal difficulty?

D. SECOND PHASE OF THE STUDY: DEVELOPMENT OF A METHOD

Following the application of the first method to the Merrill-Palmer data, a new line of attack was planned, one which would indicate more definitely which subtests, if any, differed in difficulty from the remaining subtests at a given year level. While this new method was being applied to the data, Annette L. Gillette of the Rochester (New York) Guidance Center published a study on the same subject. Inasmuch as the Merrill-Palmer study had the same purpose as hers, and since the method of analysis, in so far as it had been planned, was identical with hers, it was decided to follow her method, which had been approved by Dr. Jack Dunlap.³ This plan would make the two studies exactly comparable in method, though not in results, since Dr. Gillette’s subjects were problem children, while in general the children in this study were not. In this respect the testees in this study

³Dr. Gillette was completely cooperative in helping the writer to duplicate her method of analysis. Her air mail answers to inquiries were greatly appreciated.

resemble those of the Terman-Merrill standardization group more than those of Dr. Gillette's study.

MA level VI of Form *L* was chosen as the subject matter with which to use Gillette's method, because it included the highest number of cases. In other words, the performance on each VI subtest was tabulated for each child with an *MA* of 6-0 to 6-11, inclusive. The percentage of cases passing each subtest was calculated. The differences between these percentages "were evaluated by determining the reliability of the differences, using the critical ratio" (3, p. 127).

The σ of the percentage passing was determined by using the formula $\sigma = \sqrt{\frac{pq}{N}}$, where p equals the percentage of successes in a given subtest, q equals the percentage of failures in the same subtest, and N equals the number of cases (number of individuals taking the subtest).

The use of this formula may rest upon an assumption that the chance of success of a given subtest equals the chance of failure. The validity of this assumption might well be evaluated by detailed study of the Terman-Merrill standardization data.

Because the percentages of successes were obtained for the different subtests on the same group of testees, a correlation between these percentages would obtain. This correlation was calculated according to this formula:

$$r_{p1p2} = \sqrt{\frac{pq'}{qp'}} \text{ when } p < p' \text{ (Dunlap and Kurtz, p. 129, formula No. 304).}$$

In this formula

$p1$ = 1st test being studied, $p2$ = second test, being compared with first,

p = percentage of successes in first test,

q = percentage of failures in first test,

p' = percentage of successes in second test,

q' = percentage of failures in second test.

The σ_D was next computed according to the following formula:

$$\sigma_D = \sqrt{\sigma_{p1}^2 + \sigma_{p2}^2 - 2r_{p1p2}\sigma_{p1}\sigma_{p2}},$$

$D = p' - p$, or difference in percentage of successes in the two tests.

Finally, the critical ratio was determined by application of the formula

$$CR_D = \sqrt{\frac{D}{\sigma_D}}.$$

When the *M-P* data were set up in the same way that Gillette used (*MA* level VI included mental ages 6-0 to 6-11, inclusive), 32 cases were involved. The critical ratios for the difference in percentage of the group passing each

TABLE 4

Subtests	1	2	3	4	5
2	2.16				
3	0	2.16			
4	1.89	1.00	1.89		
5	.82	2.37	.82	2.06	
6	1.89	1.00	1.89	0	2.06

$MA = 6.0$ to 6.11 .

subtest are given in Table 4. If we consider that a critical ratio of three or more indicates a reliable difference, we may conclude that in these data there are no statistically reliable differences in the difficulty of the subtests of the VI-year tests, Form *L*.

When Dr. Gillette handled her data in this fashion, she found one reliable difference, the difference in percentage passing Subtest 1 (vocabulary) and Subtest 2 (bead chain), with the latter test more difficult (3, p. 129). This finding results from an analysis of 41 cases.

The findings on this point in these two tests are in fairly good agreement. Gillette gets a reliable difference between Tests 1 and 2, while the *M-P* study shows a critical ratio of 2.16 for the differences between the same two tests. In comparing these two studies it must be remembered that there are differences in *IQ* distribution and in type of testees used in them.

In a subsequent portion of her study, in connection with another question, Gillette selects her groups on a two-year, rather than a one-year, basis. In this connection, it occurred to the writer that it might be important to find out if a shift in the way of selecting groups would result in a shift in findings. Inasmuch as Gillette did not make this shift within the limits of the investigation of a single question (relative difficulty of subtests within a level), the answer to this query would have no bearing on her findings. However, the answer may be important in the interpretation of other studies on the subject.

The Merrill-Palmer data were therefore so culled that *MA* level VI included two years ($MA = 5.6$ to 7.5); this was the location of the interval

TABLE 5

Subtests	1	2	3	4	5
2	*3.5				
3	1.0	*3.36			
4	2.12	2.53	2.04		
5	1.74	2.89	1.50	1.16	
6	*3.5	0	*3.36	2.53	2.89

*Statistically significant difference $MA = 5.6$ to 7.5 .

used by Gillette in her subsequent study of Brightness Levels (see below). This analysis was of 74 cases. The *CR*'s found in the Merrill-Palmer data are given in Table 5.

There are four statistically significant differences, those between Tests 1 and 2, 1 and 6, 3 and 2, and 3 and 6. The *CR*'s in Table 5 could hardly be predicted from Table 4. However, when the *CR*'s for Tests 1 and 2 in these two tables are compared with the *CR* found by Gillette, there seems to be some reason to say that the vocabulary test and the bead chain test are different in difficulty for children of the same *MA*.

If the location of the interval is changed, rather than the size of it, so that all cases with an *MA* of 5-6 to 6-5 (not 6-0 to 6-11, or 5-6 to 7-5), are listed, then a new set of *CR*'s are calculated, as shown in Table 6. Here

TABLE 6

Subtests	1	2	3	4	5
2	1.98				
3	*3.40	*3.16			
4	1.50	1.88	2.30		
5	1.50	1.88	2.30	0	
6	2.83	1.44	*3.61	2.46	2.46

*Statistically reliable difference, *MA* = 5-6 to 6-5.

N equals 40. Three differences are found to be statistically reliable, those between Tests 3 and 1, 3 and 2, and 3 and 6. There seems to be a clearer relationship of this table with Table 5. Both tables are based upon analyses where the level being studied (here VI) is in the *middle* of the range of cases included in the analysis (5-6 and 6-5, and 5-6 and 7-5).

Summary of Results from the Four Different Ways of Selecting Data

Measures of the significance of differences in the percentage of cases passing

TABLE 7

<i>MA</i>	<i>N</i>	No. of statistically reliable differences found	Differences between tests
6-0 to 6-11 (Gillette)	41	1	1 and 2
6-0 to 6-11 (<i>M-P</i>)	32	0	—
5-6 to 7-5	74	4	1 and 2 1 and 6 3 and 2 3 and 6
5-6 to 6-5	40	3	3 and 1 3 and 2 3 and 6

each subtest within an *MA* level have been presented for four different ways of selecting data. Table 7 may aid in comparing these differences.

Study of Brightness Levels—Gillette and Merrill-Palmer

In the Gillette study "A further step was taken by analyzing the percentages passing each test for groups of different brightness levels. Studies on the 1916 Binet showed that some tests were easier for dull children than for bright children of equivalent *MA*. A similar evaluation seemed advisable for the tests of the 1937 Binet" (3, p. 127). To obtain fair-sized groups which were fairly homogeneous, Dr. Gillette set up groups on a two-year basis. Thus, the analysis of brightness levels of year VI includes children with an *MA* of 5-6 to 7-5, inclusive. Then she subdivided each group by *IQ* into thirds, which she called High, Middle, and Low groups. Consequently, for corresponding brightness levels at different years (for example, Low level at year VI, and Low level at year VII), the range of *IQ*'s covered will not be identical (72-94, and 74-94, in the example). The mean *IQ* for these two groups will also differ (85 and 86).

It follows that the corresponding range and mean *IQ* of the *M-P* groups vary from those in the Gillette groups. This fact invalidates direct comparison of Gillette and *M-P* data, even for the same year levels, and also comparison of her and our data from year level to year level. But comparison of different brightness levels within a year level in one or the other study is valid.

After the brightness levels had been determined for each age group, "the next step was to determine the percentage of these subgroups passing each test. Comparisons were then made within a year level between the percentage of different brightness levels passing each test and the reliability of the differences calculated. Since these percentages are based on different groups, correlation between percentages is considered zero. Therefore, the critical ratio was determined by using the formula $\sigma_D = \sqrt{\sigma_{p1}^2 + \sigma_{p2}^2}$. The interpretation is based on the fact that the dull group is older and the bright group younger" (3, p. 128). Since, in a group of individuals of the same *MA*, *CA* varies conversely with *IQ*, the mean *CA* of different brightness levels was not computed in the *M-P* study, while the mean *IQ* was. In the Merrill-Palmer data, brightness groups were analyzed only where *N* equalled at least 50. This arbitrary limit is in line with that of Gillette, in so far as her tables reveal it.

The percentage of cases in each brightness level passing the various tests in Level VI and the *CR*'s are shown in Tables 8 and 9.

TABLE 8
FORM L—YEAR VI

Bright- ness levels	N	IQ range	Mean IQ	Percentage passing for brightness levels					
				1	2	3	4	5	6
Low	24	72-94	85	83	79	88	79	75	70
Middle	27	96-103	99	80	65	76	73	76	65
High	24	104-127	115	96	75	92	88	96	79

MA range, 5-6 to 7-5.

TABLE 9
FORM L—YEAR VI

Critical ratios of difference in brightness levels on same subtest			
Subtest	Comparison of low and middle brightness levels. CR =	Comparison of low and high brightness levels. CR =	Comparison of middle and high brightness levels. CR =
1	.28	1.51	1.87
2	1.14	.33	.78
3	1.13	.46	1.62
4	.50	.85	1.39
5	.08	2.16	2.18
6	.38	.72	1.14

Our data yield no reliable differences; the highest critical ratio is 2.18. Gillette's data, based on a similar number of cases, give two reliable differences: Low-High performances on Test 4 (our CR here equals .85), and Middle-High performances on Test 4 (our CR equals 1.39). Gillette finds that for Low-High scores on Test 3 there are 98 in 100 chances that the difference is significant (our CR equals .46). She also calculates that there are 99 in 100 chances that High-Middle difference on Test 3 is significant (our CR equals 1.62).

In the *M-P* data the high group, MA level VI, is best in five tests, and worst in none. In the Gillette study the reverse is true. In the *M-P* data the Middle group is worst in five tests, in the Gillette data in only one test. The performance of the Low groups in both studies is fairly similar.

The *M-P* tabulations for Level VII are shown in Tables 10 and 11.

Our data show no significant differences, the highest CR being 1.70. Gillette gets but one, for the High-Middle performances on Test 3; here our CR equals 1.15.

In both the *M-P* and the Gillette studies the High group has, in general,

TABLE 10
FORM L—YEAR VII

Percentage passing for brightness levels									
Bright- ness levels	<i>N</i>	<i>IQ</i> range	Mean <i>IQ</i>	1	Percentage passing tests				
					2	3	4	5	6
Low	21	74- 94	86	86	57	66	71	57	66
Middle	23	96-109	100	65	56	65	78	39	78
High	21	111-145	120	86	62	48	80	52	76

MA range, 6-6 to 8-5,TABLE 11
FORM L—YEAR VII

Critical ratios of difference in brightness levels on same subtest			
Subtest	Comparison of low and middle brightness levels. <i>CR</i> =	Comparison of low and high brightness levels. <i>CR</i> =	Comparison of middle and high brightness levels. <i>CR</i> =
1	1.70	0.00	1.70
2	.06	.33	.41
3	.07	1.20	1.15
4	.53	.68	.16
5	1.22	.32	.88
6	.90	.72	.14

the best performance at this level. The Low and Middle groups are also quite comparable in this respect.

Data for year VIII are given in Tables 12 and 13.

Neither the Gillette nor the *M-P* data yield a single reliable difference at Level VIII. Our highest *CR* is 2.46. Gillette finds that the chances are 99 in 100 that the difference between Low and High groups on Test 4 is significant; our corresponding *CR* is 1.78. Gillette calculates the chances for a true difference between Low and Middle groups on Test 1 to be 98

TABLE 12
FORM L—YEAR VIII

Percentage passing for brightness levels									
Bright- ness levels	<i>N</i>	<i>IQ</i> range	Mean <i>IQ</i>	1	Percentage passing tests				
					2	3	4	5	6
Low	18	72- 96	86	72	72	33	44	83	44
Middle	20	98-115	106	80	90	60	80	85	40
High	18	116-145	128	56	83	66	72	76	66

MA range, 7-7 to 9-5.

TABLE 13
FORM L—YEAR VIII

Critical ratios of difference in brightness levels on same subtest			
Subtest	Comparison of low and middle brightness levels. <i>CR</i> =	Comparison of low and high brightness levels. <i>CR</i> =	Comparison of middle and high brightness levels. <i>CR</i> =
1	.58	1.02	.14
2	1.44	.80	2.17
3	1.74	2.11	.44
4	2.46	1.78	.50
5	.16	.53	.62
6	.25	1.36	.58

in 100, and between Middle and High groups on the same test to be 99 in 100. Our corresponding *CR*'s are .58 and .14. On the vocabulary test (Test 1) Gillette finds that the highest percentage passing is for the Middle group and the lowest for the High group. The *M-P* findings are in agreement.

Summary (Second Phase)

This phase of the study of Form L of the Revised Stanford-Binet Test was originally planned to offer answers to the following questions:

1. Are all six of the subtests within each year level of equal difficulty?
2. Are some subtests easier for brighter children, some for duller ones?
3. How do these findings compare with those of Dr. Gillette?

The results of 210 tests made on children aged from 2-6 to 12-5 were analyzed according to methods described by Dr. Gillette. Some difficulties were encountered in the use of these methods, and these difficulties led to trying slightly different methods on a smaller number of analyses than had been intended at first. These experiments in method led to a shift in the planning, and partially in the objectives, of the study. As finally conceived, this study is an attempt to shed light on the following questions:

1. Within a selected year level are all six of the subtests of equal difficulty for children of similar *IQ*?
2. How dependent is this answer upon the method of grouping the data?
3. Within a rather narrow *MA* range, does the difficulty of any of the six subtests vary with the brightness of the testee?
4. How do the results of the analyses involved in Questions 1 and 3 compare with the findings of Dr. Gillette?

The different methods of grouping the data were tried out on year level VI, because it contained the greatest number of cases. The performances on the

subtests of this level were studied for three different groups of testees: (a) those with an *MA* of 6-0 to 6-11; (b) those with an *MA* of 5-6 to 7-5, and (c) those with an *MA* of 5-6 to 6-5. These results were compared with those of Dr. Gillette, who studied the same subtest performances for her cases with an *MA* of from 6-0 to 6-11, only.

In the study of brightness levels a two-year *MA* range was studied. The results were compared with those of Dr. Gillette.

Findings (Second Phase)

1. When the Gillette method of grouping data for subtest difficulty is used on the *M-P* data, no tests in year level VI differ significantly from one another in difficulty.

2. The apparent, relative difficulty of subtests depends in part upon the method of grouping the data. A change in the size of the interval (as from one to two years) is not required to find more significant differences. A shift in the location of the interval (as from 6-0 to 6-11, to 5-6 to 6-5) may have the same results.

3. In general there is a tendency for children of higher *IQ*'s (within a two-year *MA* range) to do better than those of the same *MA* range, but of lower *IQ*, on the same subtests. In other words, when children of similar *MA* are compared, the younger ones do better than the older ones on the same subtests. This result supports the idea that the subtests test *MA* rather than simply the length of life experience, or *CA*.

4. When Gillette's method of analysis is duplicated for the study of one year level, the results are in close agreement; she obtained one significant difference in difficulty of subtests and the *M-P* study obtained none. The *M-P* study yielded a *CR* of 2.16 on the comparison which, for Gillette, showed a significant *CR*. There seems to be little relation between the brightness level analysis findings of Dr. Gillette and those of this study, although the methods used were identical.

Thus, the study showed evidence of less difference in the difficulty of subtests within a year level than subjective judgment, though based upon experience, had indicated was present. The extent and number of significant differences varied according to very simple shifts in the *MA* limits of the groups into which cases were formed for purposes of analysis. This fact, plus the questionable assumption that each subtest involves an equal chance of success or failure when taken by testees of a given *CA*, suggested the development of a third method of analysis which would attempt to solve, perhaps

by avoidance, the questions of (a) grouping the data by age intervals, and (b) assuming an equal chance of success on each subtest.

The method developed and the findings resulting from its application are described below.

E. THIRD PHASE OF THE STUDY: DESCRIPTION AND APPLICATION OF THE THIRD METHOD OF ANALYSIS

Each year level was studied separately. Cases were selected for analysis on the basis of having taken every subtest within a year level. Thus, in the study of VI year subtests, all cases who had taken all six of these subtests were selected, regardless of their *CA*, *MA*, or *IQ*.

The *CA* was then tabulated for each case passing, for example, Subtest 1 in year level VI. Similarly, the *CA* was tabulated for each case failing VI, 1. These two sets of tabulations were separate and, of course, discrete. The same tabulations were made for all five of the other subtests, resulting in 12 tabulations for VI.

The mean *CA* and sigma of the mean *CA* were computed for each of the 12 tabulations (six + and six — tabulations). These data provided material for answering the following questions:

Question 1: Is there a significant difference in the mean *CA* of cases passing one subtest and the corresponding figure for another subtest? Since the *IQ* distribution of this group is about normal, such a difference in the mean *CA* would indicate that subtests within a year level differ significantly in difficulty.

To answer this question, the six plus tabulations were treated separately. The difference (in months) between the mean *CA* at which one subtest was passed and the corresponding mean for a second subtest in the same year level was tabulated. The differences between each subtest and every other subtest were then recorded, a total of 15 differences in means. Using the formula $\sigma_D = \sqrt{\sigma_{M1}^2 + \sigma_{M2}^2}$, the sigmas of these differences were computed.

Finally, applying the formula $CR_D = \sqrt{\frac{D}{\sigma_D}}$, the critical ratios of the difference between the mean *CA* passing one subtest within a year level, and the corresponding mean for each of the other five subtests were calculated, resulting in 15 *CR*'s per year level.

Question 2: Is the mean *CA* for cases failing a subtest significantly different from the mean *CA* for cases passing the same subtest? If so, the discriminative capacity of that subtest is enhanced.

Half the data for the investigation of this question had been organized before, in answering Question 1. It was necessary only to compute the *CR* for + and — tabulations for the corresponding subtests. (For example, the *CR* between the mean *CA* of cases passing and the mean *CA* of cases failing Subtests VI, 1.) Obviously, there would be six of these *CR*'s for each year level.

Question 3: Corollary to these two questions, if more than two points (mean *CA* of cases passing and mean *CA* of cases failing) are computed for each subtest, in other words if we refine the detecting instrument, will the similarity between the subtests at a given age level persist? If the similarity holds up under closer inspection, we have added reason to say that the subtests within an age level are of equal difficulty.

In answering the first two questions, the 50th percentile *CA* of cases passing, and of cases failing, each subtest was computed. As a way of answering this third question, deciles were computed. Thus the instrument was refined to some degree. These results were graphed. Deciles for cases passing a subtest were placed on the same graph as the deciles for cases failing the same subtest. Thus a graph of success and of failure for each subtest was produced which facilitated the ease with which subtests could be superficially compared.

Question 4: On the basis of these data can the subtests within each year level be arranged in order of apparent difficulty?

This arrangement, applying to this group of subjects, can be made simply by listing the subtests within a year level according to the 75th percentile *CA* of cases passing them. Some psychologists believe that tests are best compared according to the 50th percentile. This arrangement can also easily be made. We should expect these two arrangements to be essentially the same.

Results

In Table 14 are organized the data answering Question 1 (Is there a significant difference in the mean *CA* of cases passing one subtest and the corresponding mean for another subtest within the same year level?) In the table, *N* differs within a year level, because, while the number of cases *taking* a level is the same for all those subtests, the number *passing*, or failing, the various subtests varies.

Year levels X and XI were not analyzed in this way because in them *N* sometimes fell below 20.

Perusal of Table 14 shows that not a single critical ratio is statistically significant.

TABLE 14

THE CRITICAL RATIOS OF THE DIFFERENCE BETWEEN THE MEAN *CA* OF CASES PASSING ONE SUBTEST (WITHIN A YEAR LEVEL) AND THE CORRESPONDING MEAN FOR EACH OF THE OTHER FIVE SUBTESTS

Subtests	1	2	3	4	5
Year level III ($N = 20$ to 25)					
2	.59				
3	0	.55			
4	.85	.27	.84		
5	.57	0	.56	.28	
6	.29	.28	.28	.56	.28
Year level III-6 ($N = 24$ to 32)					
2	.76				
3	.34	.54			
4	.34	.54	0		
5	.34	.54	0	0	
6	0	.87	.46	.45	.45
Year level IV ($N = 34$ to 44)					
2	.92				
3	0	.80			
4	0	.84	0		
5	.47	1.34	.41	.42	
6	1.34	2.12	1.18	1.22	.86
Year level IV-6 ($N = 47$ to 68)					
2	.98				
3	0	1.01			
4	1.88	.93	1.94		
5	.95	0	.98	.92	
6	.97	0	1.00	.93	0
Year level V ($N = 70$ to 96)					
2	1.46				
3	1.00	.54			
4	0	1.52	1.04		
5	.47	1.00	.51	.48	
6	.48	1.03	.53	.50	0
Year level VI ($N = 92$ to 111)					
2	1.00				
3	.51	.50			
4	.98	1.91	1.46		
5	0	.98	.50	.96	
6	1.28	0	.49	1.90	.97
Year level VII ($N = 64$ to 97)					
2	.38				
3	.33	1.10			
4	0	.38	.83		
5	.79	1.06	0	.79	
6	1.73	1.13	2.45	1.72	2.34

TABLE 14 (continued)

Subtests	1	2	3	4	5
Year level VIII ($N = 46$ to 88)					
2	1.80				
3	.65	.99			
4	.67	1.02	0		
5	.72	1.10	0	0	
6	2.06	.34	1.27	1.31	1.40
Year level IX ($N = 29$ to 55)					
2	.26				
3	1.92	1.50			
4	.27	0	1.56		
5	.80	.98	2.54	1.02	
6	.26	0	1.52	0	.98

Table 15 gives the data for answering Question 2 (Is the mean *CA* of cases failing a subtest significantly different from the mean *CA* of cases passing that same subtest?). In this table, *N* equals the number of cases taking the subtests in the year level indicated. Where the number failing or passing a subtest was less than 20 (year levels III and III-6, X and XI), critical ratios for Table 15 were not computed. Statistically significant

TABLE 15

THE CRITICAL RATIOS OF THE DIFFERENCE BETWEEN THE MEAN *CA* FAILING A SUBTEST AND THE CORRESPONDING MEAN FOR THE CASES PASSING THE SAME SUBTEST
(FORMER WAS ALWAYS LOWER THAN LATTER)

Year level	1	2	3	4	5	6	<i>N</i> cases	<i>N</i> signif. CR's
IV	1.80	2.56	3.02	1.90	4.03	6.42	55	3
IV-6	1.26	3.78	.96	2.80	1.88	2.50	82	1
V	1.87	2.89	3.19	1.90	4.43	6.43	110	3
VI	6.48	8.33	8.65	7.61	6.47	7.56	156	6
VII	6.58	5.58	8.92	7.89	7.38	4.65	163	6
VIII	7.94	5.49	4.84	5.76	8.00	3.52	153	6
IX	5.52	3.44	1.48	4.26	6.10	3.48	117	5

critical ratios appear in 30 of the 42 possibilities. The number of significant critical ratios in general rises with the number of cases analyzed in a year level.

The graphs included in this report are in answer to Question 3. In general, subtests within a year level are more similar to one another, so far as these success-failure graphs show, than are subtests in different age levels. It is interesting that at the VII year level the mean *CA* for success in each of the six subtests is quite close to 7 years. As the graphs show, in all year levels below VII the mean *CA* for success in the subtests is above the age

Year level IV

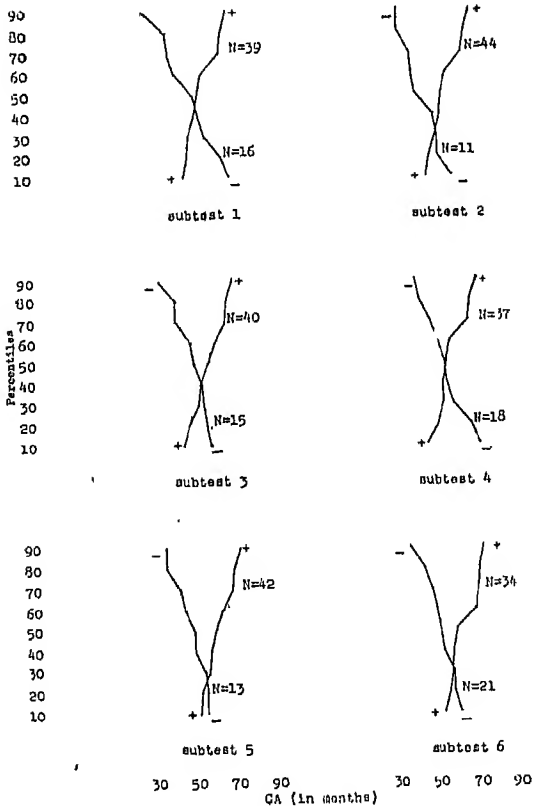


FIGURE 1

for which the level is named (thus, the mean *CA* for subtests of year level IV exceeds 4 years). But in the two year levels above VII the mean *CA* is below the age for which the level is named. Inasmuch as the distribution of the total number of Form *L* cases used in this study is positively skewed, it is difficult to account for this tendency in terms of the distribution of *CA*'s. In fact, this distribution might lead us to expect the opposite tendency. Comparison of these graphs with similar ones based on Terman and Merrill's data would prove interesting. Those data are soon to be published.

Comparison of the slope of the success line for different year levels is also interesting. For example, the slope for V is fairly steep, apparently

much more so than the curve for IX. The slope for all subtests of each year level seems quite consistent.

Table 16 shows the results of listing subtests within each year level accord-

TABLE 16.
SUBTESTS ARRANGED WITHIN EACH YEAR LEVEL, ACCORDING TO INCREASING DIFFICULTY;
50TH AND 75TH PERCENTILE *CA* ARE SHOWN FOR EACH SUBTEST

Year level	50 percentile subtest	<i>CA</i>	75 percentile subtest	<i>CA</i>	Year level	50 percentile subtest	<i>CA</i>	75 percentile subtest	<i>CA</i>
IV	1 } *		1 }		VI	1 }		1 }	
	2 }	57	2 }			5 }	79	5 }	88
	4 }		3 }	69		2 }		3 }	90
	3 }		4 }			3 }	81	6 }	91
	5 }	59	5 }			4 }		2 }	92
	6 }		6 }			6 }		4 }	93
IV-6	1 }		1 }		VII	6 }	82	6 }	96
	3 }	67	3 }	70		1 }		1 }	99
	2 }		5 }			4 }	88	2 }	100
	5 }	68	2 }			2 }	90	4 }	
	6 }		4 }	71		5 }	91	5 }	101
	4 }	69	6 }			3 }	92	3 }	104
V	2 }		2 }		VIII	2 }	91	2 }	104
	3 }	69	3 }	76		6 }	92	4 }	106
	5 }		5 }	77		3 }	95	1 }	
	6 }	70	6 }	78		4 }		3 }	107
	1 }		1 }			5 }	96	5 }	
	4 }	71	4 }	79		1 }	98	6 }	
					IX	3 }	93	3 }	107
						1 }	96	1 }	
						2 }		2 }	108
						4 }	97	4 }	
						6 }	100	6 }	110
						5 }	106	5 }	112

*Subtest with same *CA* are bracketed.

ing to the 50th and the 75th percentile *CA* of cases passing them. The subtests are arranged in order of increasing *CA* (increasing difficulty) within the year level. The table must be regarded only as suggestive of a method of organizing subtests within a year level, because differences in the mean *CA* for each group of subtests were all insignificant (see Table 14).

The two arrangements (according to 50th and to 75th percentile) are, as we should expect, very similar. It is striking, however, that though this method was devised to study subtests within a year level (since the author believed the nature of the data to be such as not to warrant inter-level comparisons), the arrangement in Table 16 yields a scale of subtests which progress in difficulty not only within each year level, but also from level

Year level IV-5

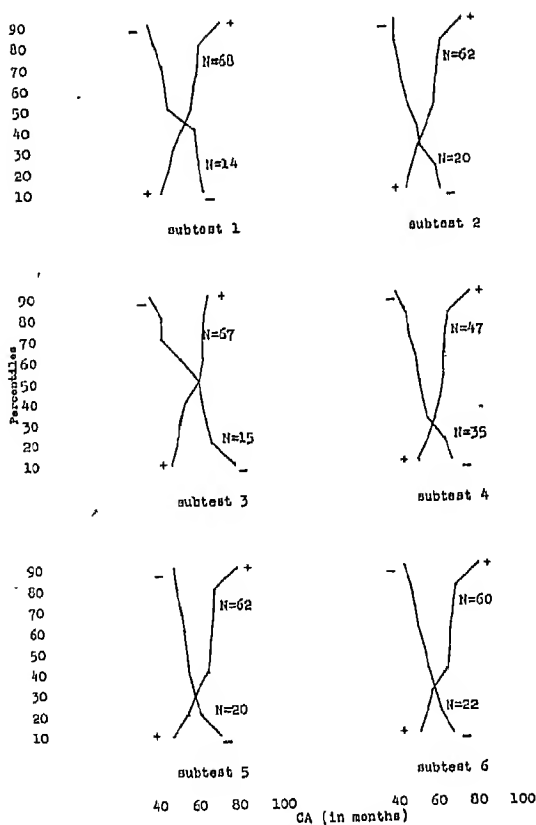


FIGURE 2

to level. This result seems to be a point in favor of the placement of the Terman-Merrill subtests. For example, if we adopt the 75th percentile as the standard according to which we shall arrange the subtests, there is no need to shift the position of them from one level to another. For the 75th percentile *CA* goes, by subtests, from 69 to 112 months, with absolutely no overlapping between year levels. If we arrange subtests according to the 50th percentile *CA*, there are but two disturbances of the smoothness of this arrangement: the transition from year level VII to VIII, and from VIII to IX. To be sure, Terman and Merrill did not arrange subtests according

Year level V

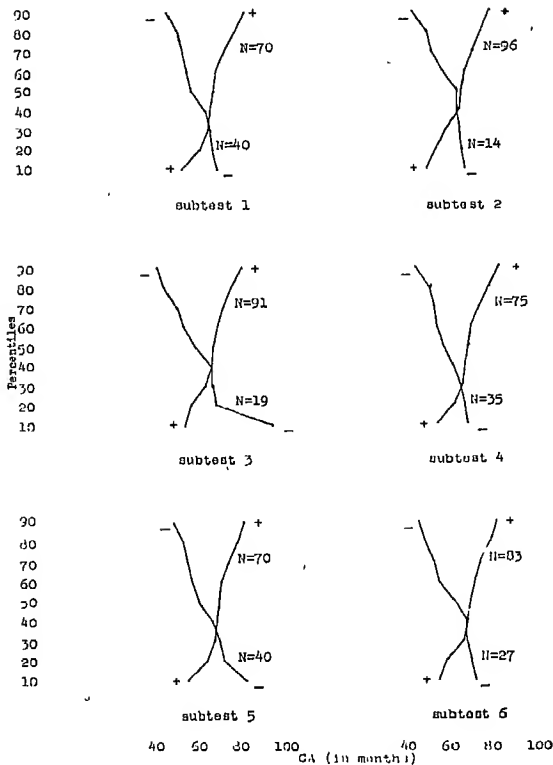


FIGURE 3

to the percentage of cases of a certain *CA* passing them, but only in such a way that for any age group the mean *IQ* would be as close as possible to 100. Nevertheless, the results of the two methods seem to be in close agreement, and the data of Terman and Merrill, soon to be published, will be all the more interesting to study. If the two methods yield the same arrangement of subtests, then choice as to which method to use may well rest upon some other point, such as ease of application.

Year level VI

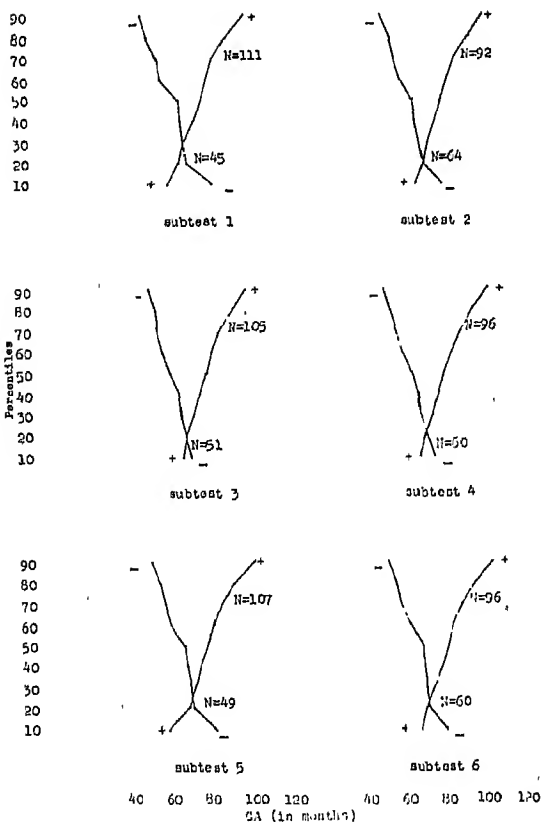


FIGURE 4

Summary (Third Phase)

The central question of this phase of the study remained, as in the first two sections, the questions of the relative difficulty of subtests of the Revised Stanford-Binet Intelligence Test. Each year level was studied separately. Cases were used at each level only if they had taken all six of the subtests at that level. The *CA* of each case passing a given subtest was tabulated, and the *CA* of each case failing the subtest was also listed, in two separate tabulations (called plus and minus tabulations). The mean *CA* and sigma of the mean *CA* were calculated for each of the tabulations. Critical ratios

Year level VII

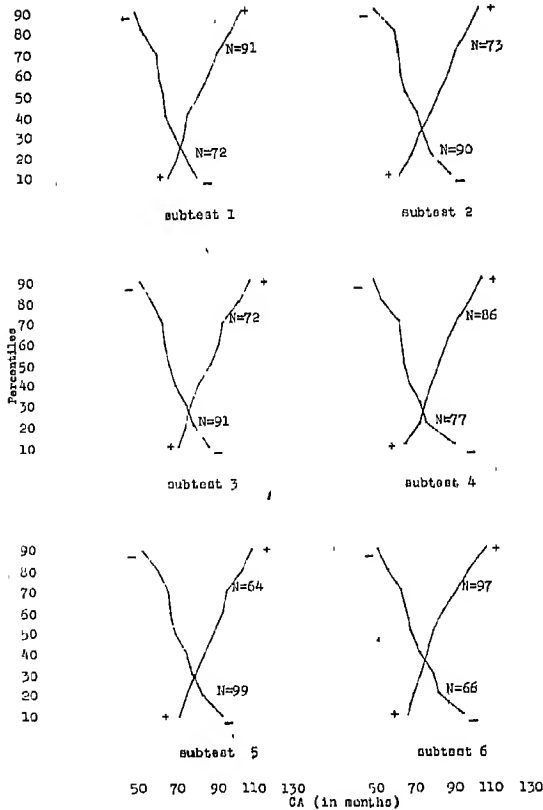


FIGURE 5

were computed to indicate the possible significance of differences in the mean *CA* of cases passing the six subtests in each level, and also of cases passing and of cases failing the same subtest. In addition to computing the median (50th percentile) *CA* for each tabulation, deciles were figured, and these deciles were graphed, yielding a two-line graph for each subtest, one line representing failure, the other successes. These graphs permit a quick, somewhat superficial judgment as to the similarity in difficulty in the subtests within a year level. The subtests were finally arranged within each year level according to the 50th and to the 75th percentile *CA* of the cases passing

Year level VIII

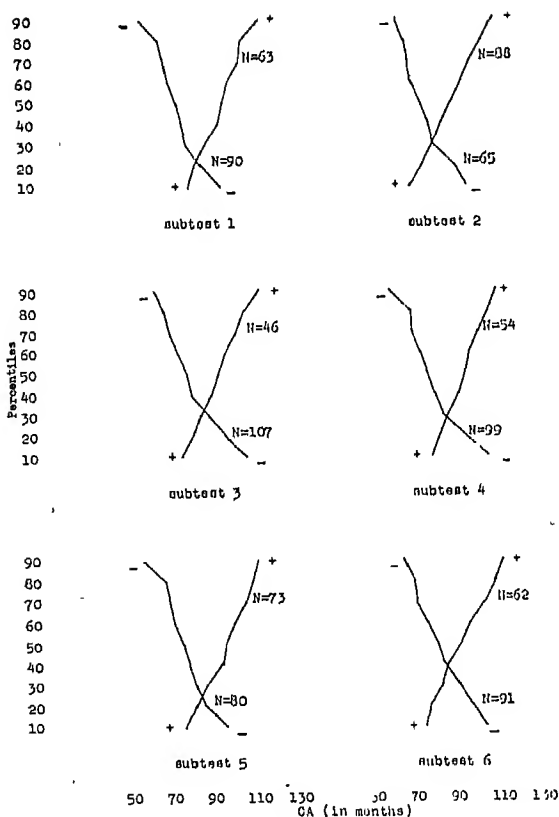


FIGURE 6

them. It was recognized that this latter step, for these data at least, was of purely methodological interest, since the initial step of this phase of the study showed that there were no significant differences in the mean *CA* of cases passing the various subtests.

Conclusions (Third Phase)

1. There was not a single significant difference between the mean *CA* of cases passing one subtest and the corresponding mean for another subtest within the same year level, indicating that within a year level (III to IX) subtests, for these cases, did not differ in difficulty.

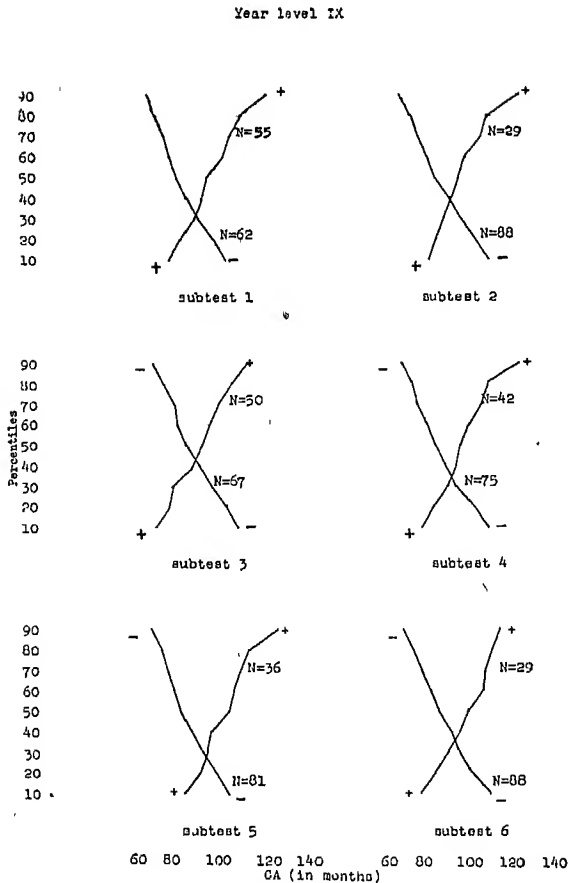


FIGURE 7

2. In 30 of 42 subtests (year levels IV to IX) the mean *CA* of cases passing differed significantly from the mean *CA* of cases failing the same subtest. In general, the number of significant critical ratios of this sort, within a year level, rose with the number of cases analyzed. These two findings indicate that most of the subtests are definitely discriminative as separate test entities. In other words, for about 70 per cent of the subtests analyzed in this manner, the ability to pass a subtest is in itself significant, even without the results of the entire test.

3. Graphing the decile ages of those who passed, and of those who failed, the subtests, indicates further that the subtests within year levels IV to IX

are of similar difficulty. Owing to the nature of the distribution of cases used in this study, these graphs do not yield as much as they might in another, more nearly normal distribution, in which the possibility of interpreting the point of crossing of the two lines for each subtest is of interest for this point, at which the chance of success equals the chance of failure, may prove of significance in the study of subtests, as well as in their placement.

4. Subtests can be arranged in this study, within an age level, according to the 75th or the 50th percentile *CA* of cases passing them. These two arrangements are fairly similar, as would be expected. However, for these data such an arrangement is without meaning, except from the point of view of methodology, as none of the differences in the mean *CA* of cases passing subtests was found to be real.

E. SUMMARY AND CONCLUSIONS FROM THE STUDY AS A WHOLE

Experience in supervising the testing program at the Merrill-Palmer School suggested the question of whether or not the subtests in the Revised Stanford-Binet Test were appropriately placed with reference to difficulty. Results from individual test performances on 210 Form *L* and 118 Form *M* tests were recorded over a period of four years. The tests were given by students, but were rigorously supervised and checked, so that the writer has confidence in the test results. The study is composed of three phases: (a) comparison with the results of Mrs. Elsa Barber, according to her method of analysis, (b) comparison with the results of Dr. Annette L. Gillette, following her method of analysis, and (c) development of a third method, with the results of applying this method.

The first method indicated that some of the subtests within a year level were of unequal difficulty. However, the last two, more refined methods, indicated that in general the subtests within a year level were of equal difficulty. In the interpretation of the findings of any of these methods the nature of the distribution of cases must constantly be kept in mind. Because of the skewed nature of the Merrill-Palmer data, the third phase of the study should be considered primarily as an adventure in method, and the findings should be closely interpreted in the light of the nature of the data. Thus considered, the agreement in the findings of the separate phases of this study is such as to lend confidence in the placement of the subtests of the Revised Stanford-Binet Test.

1. Findings

1. Application of Barber's method to the Merrill-Palmer Form *L* and

Form *M* data yielded some differences in difficulty in subtests within year levels. However, the Barber study and the present study do not agree as to which subtests differ in difficulty.

2. Study of the question would benefit from a refinement of the method used by Barber.

3. Gillette's method offers a refinement in method.

4. Application of Gillette's method to the Merrill-Palmer Form *L* data for year level VI indicates that these tests are of equal difficulty.

5. The apparent relative difficulty of subtests depends in part upon the method of grouping the data.

6. In general, the *M-P* data indicate that when children of similar *MA* are compared, the younger ones do better than the older ones on the same subtests. This result supports the idea that the subtests test *MA* rather than simply the length of life experience, or *CA*.

7. When Gillette's method of analysis is followed in the study of one year level, the results are in close agreement, and differences found in the difficulty of subtests are negligible.

8. The second phase of the study shows evidence of fewer differences in the difficulty of subtests within a year level than would be inferred from subjective, experienced judgment. But since this conclusion may vary with very simple shifts in the arrangement of the data, and since this method further implies the questionable assumption of equal chance of success or failure on each subtest when taken by testees of a given *CA*, a further refinement or substitution of method might well be sought.

9. A third method of analysis was devised which appears to have possibilities for future use. It is simple and apparently solves the two difficulties found in the Gillette method, but in using it the character of the distribution of data must be kept in mind. In a perfectly normal distribution its application would have wider results than are obtainable in this study.

10. This method shows subtests within year levels III to IX to be equal in difficulty for these data.

11. The passing or failing of an individual subtest may in itself be important, even without the results of the entire test.

12. Graphing information obtained by this third method of analysis permits a rapid view of some of the gross aspects of the subtests. This method of graphing, particularly if used in conjunction with data forming a normal distribution, has further possibilities for the study of subtests.

13. This third method permits the arrangement of subtests within a year level in order of difficulty. In more nearly perfect and normal data, it

would be possible to arrange subtests in this order between year levels also. Even with the present data, this arrangement supports the validity of the Terman and Merrill arrangement.

2. *Conclusions*

1. The findings tend to confirm confidence in the similarity in difficulty of the subtests within any of the separate year levels of the Revised Stanford-Binet Test studied in this investigation.

The study also emphasizes the need for constant vigilance in setting up methods of analysis, and for understanding the relation between the nature of the original data and the conclusions which can logically be reached.

A list of the names and number of the subtests studied is appended.

APPENDIX: REVISED STANFORD-BINET, FORM L

Names of Subtests Studied

	<i>Year level III</i>
Subtest 1.	Stringing Beads
2.	Picture Vocabulary
3.	Block Building: Bridge
4.	Picture Memories
5.	Copying a Circle
6.	Repeating 3 Digits
	<i>Year level III-6</i>
Subtest 1.	Obedying Simple Commands
2.	Picture Vocabulary
3.	Comparison of Sticks
4.	Response to Pictures I
5.	Identifying Objects by Use
6.	Comprehension I
	<i>Year level IV</i>
Subtest 1.	Picture Vocabulary
2.	Naming Objects from Memory
3.	Picture Completion: Man
4.	Pictorial Identification
5.	Discrimination of Forms
6.	Comprehension II
	<i>Year level IV-6</i>
Subtest 1.	Aesthetic Comparison
2.	Repeating 4 Digits
3.	Pictorial Likenesses and Differences
4.	Materials
5.	Three Commissions
6.	Opposite Analogies

- Year level V*
- Subtest 1. Picture Completion: Man
2. Paper Folding
3. Definitions
4. Copying a Square
5. Memory for Sentences
6. Counting 4 Objects
- Year level VI*
- Subtest 1. Vocabulary
2. Copying a Bead Chain from Memory I
3. Mutilated Pictures
4. Number Concepts
5. Pictorial Likenesses and Differences
6. Maze Tracing
- Year level VII*
- Subtest 1. Picture Absurdities I
2. Similarities: Two Things
3. Copying a Diamond
4. Comprehension III
5. Opposite Analogies I
6. Repeating 5 Digits
- Year level VIII*
- Subtest 1. Vocabulary
2. Memories for Stories: The Wet Fall
3. Verbal Absurdities
4. Similarities and Differences
5. Comprehension IV
6. Memory for Sentences III
- Year level IX*
- Subtest 1. Paper Cutting I
2. Verbal Absurdities II
3. Memory for Designs
4. Rhymes: New Form
5. Making Change
6. Repeating 4 Digits Reversed
- Year level X*
- Subtest 1. Vocabulary
2. Picture Absurdities II
3. Reading and Report
4. Finding Reasons I
5. Word Naming
6. Repeating 6 Digits
- Year level XI*
- Subtest 1. Memory for Designs
2. Verbal Absurdities
3. Abstract Words I
4. Memory for Sentences IV
5. Problem Situation
6. Similarities: Three Things

	<i>Year level XII</i>
Subtest 1.	Vocabulary
2.	Verbal Absurdities II
3.	Response to Pictures II
4.	Repeating 5 Digits Reversed
5.	Abstract Words II
6.	Minkus Completion
	<i>Year level XIII</i>
Subtest 1.	Plan of Search
2.	Memory for Words
3.	Paper Cutting I
4.	Problems of Fact
5.	Dissected Sentences
6.	Copying a Bead Chain from Memory II

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Between March, 1942, when this article was accepted for publication, and May, 1943, when Mrs. Fleming died, McNemar's study of the standardization data of the revision of the Stanford-Binet was published. Mrs. Fleming referred to this study twice in the present article, and it is very probable that she would have made some comparison of McNemar's findings with her own, had it been possible. Mrs. Fleming's data and calculations are on file at the Merrill-Palmer School and may be examined by applying to Dr. Russell C. Smart.

A STUDY OF SOCIAL MATURITY IN PERSONS SIXTEEN THROUGH TWENTY-FOUR YEARS OF AGE*¹

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Much interest has been displayed in recent years, by educators, psychologists, and sociologists, in the social development of our citizenry. There are many who have voiced the belief that fostering desirable social behavior is among the chief responsibilities of the schools. Indeed, some outstanding educational leaders have gone so far as to express the opinion that this is the prime obligation of the present-day school. S. L. Pressey, for example, has said that (32, p. 102) not only might we consider the guidance of social development as the "first purpose of a modern school," but that the sad neglect shown towards this aspect of the child's education is "the outstanding weakness of the traditional school."

One of the most obvious features of the literature concerned with the socialization of students is this almost invariable belief that the schools are guilty of especial neglect, if not, indeed, that school life has a tendency to retard desirable social development. It has been stated that college life is so unproductive of social adequacy (9, p. 257) that no one can serve as a college adviser without being acutely aware that large numbers of students lack even the ordinary social graces to such an extent that they live in comparative isolation despite daily contacts with hundreds of people. Some critics of college life have gone even further, asserting (12, p. 333) that college life is not "real," but a highly artificial environment which approaches mundane reality only during the football and commencement seasons. Owings, viewing student behavior from the standpoint of citizenship, also sees a lack in the collegiate community with respect to the extremely important training for responsible and constructive community participation (31, p. 708).

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¹This article is based upon (and is in some respects an extension of) a doctoral dissertation presented to the Faculty of the Graduate College in the University of Nebraska in 1940. The writer wishes to express his great indebtedness to Dr. D. A. Worcester, Chairman of the Department of Educational Psychology and Measurements at that institution, who suggested and supervised the study. The writer is also indebted to Dr. Ralph C. Bedell, of the same university, for frequent advice on many points of the investigation. Thanks are also due to Dr. J. P. Guilford, of the University of Southern California, who assisted greatly with suggestions pertaining to the statistical aspects of the study.

From these rather typical beliefs, two things of educational significance are apparent. First, there are those who feel it incumbent upon the schools to facilitate wholesome social activity. Secondly, there is the criticism, both explicit and implicit, that college students are exceedingly retarded with respect to this type of growth and development.

With the first of these beliefs, the writer is not greatly concerned in this study. Whether or not the schools are under the obligation to concentrate upon habits of good citizenship and social competence is primarily a matter for the consideration of those dealing with problems of educational policies, objectives, and philosophy.

It is with the second of these beliefs—viz., that college students are especially weak in their social behavior patterns—that the writer is herein concerned. Here is a problem which should be subject to objective determination and measurement. Mere opinionation is a weak basis for the comparison of large groups with respect to such varied and involved personality traits as social maturity and competence. In an effort to replace subjective thought by more definitely and objectively determined judgment, the writer has undertaken an inquiry into the nature of social growth at the ages of 16 through 24 (its measurement in college and non-college groups in this particular range of years).

THE NATURE OF SOCIAL MATURITY

Social maturity, or social competence, has been variously defined and described. Hocking, for example, has stated (28, p. 241): "Gravity never grows nor declines in strength; but sociability grows as the mind matures, and tends to decline with its further growth." And Ross has said (33, p. 652): "By socialization is meant the development of the *we* feeling in associates and their growth in the capacity and will to act together." Hart has commented (27, p. 7) that Ross's definition "does not appear to differentiate socialization from mob-mindedness." Garrison (24, p. 108) adds to such general statements by saying that "social development refers to the maturity of the individual in his social relationships."

Brooks is more specific (8, p. 139): "*Social age* or maturity denotes the stage of development of social attitudes, habits, and skills—the ability to make adjustments involving other human beings—and is much the same as social intelligence. . . . Moral development and religious development are often included under this." He also pointed out the lack of agreement among social scientists, as well as the need for adequate measurement. According to Brooks, vague generalizations about social growth are worthless, and the true

story of its development before and during adolescence is still to be written (8, p. 92).

Cole has given a more lengthy account of social maturity (11, pp. 486-7). This writer describes the socially mature person as being neither unreasoning in his prejudice towards anyone who is different nor blindly loyal to his friends, one who can maintain ordinary business relationships with almost any normal adult. The mature person is further described as being at ease in ordinary social situations rather than distressed or embarrassed. Maturity is also indicated by the seeking of relatively quiet diversions, such as game attendance, reading, theater-going, and small social gatherings.

Doll, who has made intensive investigation of social maturity and its measurement, has found (20, p. 895) that "a remarkable similarity of the 'way of growing up' exists among children regardless of special training or environments." He considers the gradual increase of independence as one of the major aspects of social maturity. Although none ever reaches a stage of complete independence from his fellows, we do "reach a certain standard of independence which is considered average or normal in a world where some degree of dependence upon our fellows is inevitable" (18, p. 3).

Garrison (24, p. 108) has indicated further that this independence from the family is concomitant with growing dependence upon outside groups. Burnham has given a definition of social age (10, p. 248) as "the stage of an individual's development as gauged by one's social accomplishments, ability to do the fitting thing, and get on successfully and without friction in the conventional social groups."

From the preceding quotations, one sees that within the varying views certain general aspects of social maturity have been noted by the writers on the subject. First, there is the belief that social growth is manifested in increasing independence of the family. One of the most obvious attributes of the socially competent person is his freedom from the necessity to be cared for by others. That is to say, he is quite capable of protecting himself from the ordinary hazards of his environment, to look after his own needs with respect to feeding and clothing himself. He assumes, moreover, some measure of responsibility for his own actions; and he governs his present behavior with regard for his own future welfare. These, then, are some of the elements which constitute the socially mature personality.

But we must not overlook the fact that at some point on the scale of independence we pass beyond what is socially desirable and approved. For example, the man who would feel so free from the aid of others that he would try to extinguish the fire of a blazing building without seeking the aid of a con-

venient fire department organized for that type of emergency would certainly be described by his fellows as "childish" or "stupid." Again, the hermit is frowned upon as "queer." To be sure, he may be looked upon with great admiration if he brings forth from his solitude thoughts of great value to the social group. But it is to be noted that such commendation is *ex post facto*. Doll has expressed well the viewpoint of the social group in evaluating behavior (16, p. 766):

A well-known novelist recently made the cogent statement that nothing that happens is important except as it happens to some person. Just as there is no sound without an ear to hear it, so there is no behavior without some person to observe or experience it. We may elaborate this thought into the dogmatic statement that no behavior is important except in terms of its social value. While this is not strictly true of those intimate experiences which take place within the self as a unique organism, nevertheless even such intimate personal behavior is irrelevant to everyone else except in terms of its social impact.

There is apparent, then, a second aspect—one that might be called the "dependence" aspect—of the socially mature personality. This is reflected in the extent to which one associates with the group of which he is a part; the degree to which he shoulders a share of the responsibility for group needs; the amount of respect he displays for group laws, customs, and restrictions; and, finally, the extent to which his behavior contributes to the welfare and betterment of society.

Here again, as in other personality traits, we observe a disapproval of extremes on the part of society. The man who is so actively engaged in group affairs that he neglects the proper care of himself and his family is often described as a "fanatic," or eccentric, or merely as a "fool." On the other hand, a college student who refuses to join any social group, or dislikes intensely all persons of the opposite sex, would be labelled a "queer duck" (if not even more disrespectfully classified) and become an object of dire concern to student counselors.

Evidently, society does not like its members to stray too far from the mean in either direction. Those who are at adulthood so dependent that they must be clothed and fed by others are customarily placed in public institutions. We note that "idiot" is a word used not only for purposes of scientific classification, but quite commonly is employed as a term of contempt and epithet. At the other extreme, that of too great independence, some wander too far from the central tendency in their attitudes and actions. Those, for instance, who seek to maintain an entirely impartial and objective

attitude towards the belligerents in the current European war, while the great mass of Americans is strongly pro-Allied in its leanings, find themselves in a difficult position. Briefly, we approve of that person who does not burden his fellow men with his care, yet expresses his independence through desirable and acceptable channels.

Despite a seeming contradiction between these two ways of looking at what we have chosen to call social maturity, these aspects—viz., social independence and dependence—are, in reality but two ways of looking at the same thing. To take Spinoza's analogy, a thing may be either concave or convex, depending upon whether we look at it from one side or the other. Our two aspects, likewise, are but separate views of one thing: social competence.

Yet another facet of social maturity, the way in which leisure time is occupied, has been pointed out by Cole (11, pp. 486-7). This authority has opined that the mature person, in addition to functioning smoothly in his social relationships, indicates his stage of development by seeking "relatively quiet" diversions, such as theater-going, reading, or game attendance. "Quiet" is perhaps a poor word to use in differentiating adult from puerile pastimes, since game attendance may be accompanied by more noise than mumbledy-peg. Yet we regard certain leisure-time activities as suitable for the adult, whereas there are others we relegate to the child and adolescent. An adult who would regularly spend his leisure hours playing "hide-and-seek" or "cops-and-robbers" would be called childish by his neighbors. On the other hand, the six-year child who plays chess well is considered precocious.

Although social approval determines, to a large extent, the nature of leisure-time activities at various points along the age scale, the differences which exist might well serve as another means of judging the degree of social maturity, although it is quite possible (and even likely) that only extreme variations in some of these respects would be useful. The reason for this is to be found, no doubt, in the overlapping which exists. Baseball, for example, is participated in by the boy of 10 and the man of 30. Even the extreme variations are not entirely reliable. If an elderly man were to occasionally play tag in order to be companionable to his son, or cut out paper dolls to amuse his little daughter, it might very well indicate a commendable paternal interest rather than immaturity. But let us observe that it is not the behavior *per se* which we find acceptable in such a case. It is, rather, the underlying purpose which leads to our approval.

From this, it is to be seen that spare-time behavior, if used as an index of social maturity, must be used with much caution. Here, again, it is the

amount of social approval given to the activity, or the motive underlying it, which makes it possible, within limits, to use such behavior as an indication of social maturity. It is its social significance which matters in this connection.

From the preceding considerations, the writer feels that the degree of a person's social maturity may be assessed according to the way it is manifested in his behavior with respect to social relationships (independence-dependence), and to some extent in the way he occupies his leisure periods. And since this development ordinarily accompanies increasing age, the writer poses the following operational definition of social maturity:

"A person's social maturity is the level of socially significant behavior attained at a given age."

Admittedly, such a definition is of little value unless we know the nature, direction, and extent of these changes at the various age levels. Because mores, attitudes, emphases (and consequently what is considered mature behavior by social groups) differ not only from one social entity to another, but show temporal changes in each group, it becomes necessary to judge maturity in the light of a specific social setting at a definite period of time. In order to judge the social maturity of any group, therefore, certain criteria must be available.

CONSTRUCTION OF A GROUP TEST OF SOCIAL MATURITY

The writer was unable to discover any available test of social maturity, of the type desired, suitable for the ready comparison of rather large groups of subjects at the ages of 16 through 24. There are available several tests of social attitudes and opinions, such as the Darley-Williamson *Survey of Student Social Behavior*, parts of the adult form of the Bell's *Adjustment Inventory*, and the Pressey *Interest-Attitude Tests*. The first of these tests calls for self-description on a five-point rating scale with respect to such statements as: "Is rather shy in contacts with people," or "Enjoys entertaining people." Bell's *Adjustment Inventory* calls for a "yes," "no," or "?" response to such items as: "Do you make friends easily?", or "Do you greatly enjoy social dancing?" The Pressey *Interest-Attitude Tests*, which have been used for determining the level of social behavior (26, pp. 16-18), consist of four lists of words to be checked. In the first list, the person is to check those things which he thinks are wrong; in the second list, one is asked to check those items which occasion fear or worry; in the third word list, one is requested to check those things which he likes or in which he is interested; and

in the fourth the subject is to check those words descriptive of the kind of person he likes or admires.

The three tests just mentioned may be taken as representative of many tests in this field of personality measurement. The writer, however, is of the opinion that it is much better to judge a person's social maturity on a more behavioral basis. At least, it is desirable to do so when social maturity has been defined in terms of behavior rather than attitude or preference. Instead of asking a person to rate himself as to shyness in meeting people, one might ask how many close friends he has, or to list the organizations of which he is a member. Instead of asking the subject whether or not he enjoys social dancing, one might ask him how often he goes to dances. One might conceivably enjoy social dancing, yet attend a dance every tenth year. So despite the fact that the items used in the above-named tests may be of great value in other connections, they certainly do not seem designed to measure social maturity in its behavioral aspects. Although attitude may influence action (and in turn be influenced by it) the writer did not see any need for indirection. For this reason, he looked for a test which seeks to measure social behavior in terms of specific action instead of preference or attitude. (But just as attitude is not always an indication of behavior, so behavior is not always an index of attitude. This is illustrated by the fact that one might attend dances frequently without enjoying them at all, attending simply to be part of a certain social group.)

Doll's *Vineland Social Maturity Scale* appeared to be the type of scale desired. The items of this scale are standardized in terms of "detailed performance" and "overt expression." Doll says of his measure (13, pp. 1-2): "This Scale provides a definite outline of detailed performance in respect to which children show a progressive capacity for looking after themselves and for participating in those activities which lead toward ultimate independence as adults . . ."

The Vineland Scale, however, possesses certain qualities which made it unsuited for the writer's particular needs. First, Doll's scale is an indirect measure. Ratings are usually made through an informant. But Doll himself points out that the subject may act as his own informant with satisfactory results (17, p. 292):

In actual practice we find that the scale under certain circumstances *can* be applied with the subject acting as his own informant. In such circumstances the subject does tend to give information which develops a score about one year (perhaps ten per cent) higher than that obtained from an independent informant. However, it might easily be argued that the

subject knows his own abilities rather better than even a well-informed relative or acquaintance. Among our feeble-minded subjects, we find that the subject may reasonably well be used as his own informant as low as mental age 4 years.

The writer is of the belief that if a feeble-minded subject with an *MA* of four years may serve as his own informant satisfactorily, it should be an even more acceptable procedure with normal adults. Furthermore, there is no reason to believe that any slight tendency to exaggerate would be greater in one of the groups to be studied than in the others.

Despite the excellence of Doll's test as an individual clinical instrument, the writer felt that a group test was highly desirable, for practical considerations, in this and similar studies. There is, moreover, nothing in the nature of the test item involved to indicate that individual measurement by oral questioning is demanded at the age range 16 through 24.

Another hindrance to the use of the Vineland Scale in this instance is that it is of doubtful discriminative value with such age groups as the writer wished to investigate. Doll says (13, p. 6) that his "age scores show significant changes from age X to XV years." At the adult level, the scale is of questionable merit. The adult differences obtained are exceedingly small and of only theoretical value. For his purpose, the writer needed a test with more "ceiling."

Since the writer found no adequate group test available, a group test was designed, the purpose of which was to obtain differences in social behavior among persons 16 through 24 years of age. The material of the *Vineland Social Maturity Scale* seemed to be not only most nearly in accord with what the writer considered to be social maturity, but also most susceptible of change to group form. These things being true, most of the items actually employed in the group scale were taken from the *Vineland Scale* and worked into group form. The items as finally developed are largely of the multiple-choice kind, thus permitting of the finer discrimination of degree which, as it finally became evident, is essential for detecting differences among older subjects.

The test, as finally printed, follows.

THE TEST

On the following pages you will find questions concerning your customary behavior. Since people vary widely in these respects, there are no right or wrong answers. The purpose of these questions is simply to see whether or not certain groups of persons act differently than do others.

The scientific value of this survey depends upon your accuracy in describing yourself. Your answers will in no way affect your scholastic or employment status. Will you please, therefore, assist us by giving as exact and as frank answers as you can?

Date.....

To Be Filled In By College Students:

Name..... Age in years and months,
to nearest month

Sex..... College or University..... Major Dept.....

Class: Freshman .. Sophomore... Junior... Senior... Grad... Married or single?..

Religion: Prot..... Cath..... Jew..... Other..... Unaffiliated.....

Are you employed at part-time work?..... If so, what type of work do you do?.....

How many hours per week do you work for pay?.....

Permanent home address

Street City State

Date... ..

To Be Filled In By Full-time Employees:

Name..... Age in years and months,
to nearest month

Sex..... Name of firm by which now employed.....

Married or single?..... What is your present position?

The number of years you have been working, all told, is.....

The last school grade completed. Father's occupation.....

Religion: Prot.... Cath..... Jew Other..... Unaffiliated.....

Do you go to night school, or take any special course?

If so, what courses do you take?

Permanent home address.

Street City State

DIRECTIONS: Put a check on the line next to the answer that best describes you.
Be sure to answer ALL questions.

1. How many personal letters do you ordinarily write in a week?
 - a. 5 or more b. 3 or 4.... c. 1 or 2 ... d. None
2. Do you go alone to nearby places (outside limits of your home town)?
 - a. Frequently.... b. Occasionally... c. Rarely.... d. Never
3. Do you go alone to distant places (over 100 miles from your home town)?
 - a. Frequently .. b. Occasionally.... c. Rarely.... d. Never
4. When you are not under temporary regulations (such as sorority house rules, nurses' home regulations, etc.) do you go out at night without restriction as to where you go or when you are to return?
 - a. Frequently.... b. Occasionally.... c. Rarely .. d. Never
5. When you buy clothing accessories, do you
 - a. Usually go alone?.....
 - b. Occasionally take someone along to help select?
 - c. Almost always take someone along to help select?
 - d. Never go alone?.....
6. Do you do shopping for articles of small cost for other persons?
 - a. Frequently.... b. Occasionally.... c. Rarely.... d. Never
7. Do you do shopping for expensive articles for other persons?
 - a. Frequently.... b. Occasionally . . c. Rarely.... d. Never .. .
8. Do you have a bank account in your own name?

Yes..... No....
9. If you provide for the future in any of the following ways, please check:
 - a. Life insurance.....
 - b. Buying (or furnishing) a home.....
 - c. Regular bank deposits.....
 - d. Paying for special instruction, or courses, to equip yourself better for the future.....
 - e. Investments such as stocks, bonds, real estate, etc.....

10. Is the type of work you are now engaged in (or are you now preparing for)
 - a. Due to pressure of circumstances (such as only work available, nothing else to do, etc)?.....
 - b. Due entirely to the wishes of others?.....
 - c. Due partly to the wishes of others?.....
 - d. Entirely of your own choice and selection?.....
11. Do you control your own major expenditures of money?
 - a. Not at all.....
 - b. Only slightly.....
 - c. Partly, but to a considerable extent.....
 - d. Entirely.....
12. Do you assume responsibilities beyond your own needs, which you might avoid (such as accepting offices with clubs, organizing new groups, taking on extra work, etc.)?
 - a. Frequently....
 - b. Occasionally....
 - c. Rarely....
 - d. Never....
13. Have you ever contributed to the support of others in your family?
 - Yes.....
 - No.....

If yes, for how long a period have you done so?.....
14. How many very close friends do you have at the present time?
 - Of the same sex:
 - a. None.....
 - b. 1 or 2.....
 - c. 3 or 4.....
 - d. 5 or more....
 - Of the opposite sex:
 - a. None.....
 - b. 1 or 2.....
 - c. 3 or 4.....
 - d. 5 or more....
15. Do you contribute to the church?
 - a. Regularly.....
 - b. Quite often.....
 - c. Occasionally.....
 - d. Rarely.....
 - e. Never.....
16. Do you contribute to other philanthropic agencies (such as Community Chest, Red Cross, etc.)?
 - a. Regularly.....
 - b. Quite often.....
 - c. Occasionally.....
 - d. Rarely.....
 - e. Never.....
17. Have you earned your own living expenses?
 - a. None.....
 - b. Spending money only.....
 - c. Some.....
 - d. All.....

If you have earned some or all, for how long a period have you done so?....
18. Do you find it hard to make decisions alone?
 - Yes.....
 - No.....
19. At present, are you living
 - a. With your parents?.....
 - b. Away from parents, in another city, but with relatives?.....
 - c. Away from parents and relatives, but in same city?.....
 - d. Away from parents and relatives, in another city?.....
20. Do you consider yourself the type of person who inspires confidence in others?
 - Yes.....
 - No.....
21. Are you helpful in emergencies (that is, do you do such things as administer first aid, help motorists on the road when you see them in difficulty, etc.)?
 - Yes.....
 - No.....
22. Are you consulted in matters requiring good judgment or leadership?
 - a. Frequently....
 - b. Occasionally....
 - c. Rarely....
 - d. Never....
23. Do you follow current events (general news)?
 - a. Almost never.....
 - b. Now and then, but without regularity.....
 - c. Fairly regularly, with some continuity.....
 - d. Daily, and with continuity.....
24. Do you enjoy going alone to picture shows, lectures, etc.?
 - Yes.....
 - No.....
25. When you are not under temporary regulations (such as sorority house rules, nurses' home regulations, etc.) how many evenings, in an ordinary week, do you stay at home without guests or visitors?
 - a. 5 or 6.....
 - b. 3 or 4.....
 - c. 1 or 2.....
 - d. None.....

26. How often, in an ordinary week, do you go to the movies?
 a. About 3 times a week..... c. About once a week.....
 b. About twice a week..... d. Less than once a week.....
27. Do you answer magazine, radio, or newspaper ads by mailing coupons, requesting samples, sending for literature, or ordering from catalogues?
 a. Frequently.... b. Occasionally.... c. Rarely.... d. Never
28. Have you ever had a "blind" date in order to accommodate a friend or relative?
 Yes..... No.....
29. Do you have any charge account in your own name, or one that you can use?
 Yes..... No.....
30. Do you know how to drive a car?
 Yes..... No.....
31. Do you go to dances when you are not under temporary regulations (such as sorority house rules, nurses' home regulations, etc.)?
 a. Frequently..... c. Rarely.....
 b. Occasionally..... d. Never.....
32. Do you like to have assistance in getting dressed for special occasions?
 Yes..... No.....
33. Do you have fairly regular checkups on your physical condition (such as periodic visits to dentists or doctors)?
 Yes..... No... ..
34. Are you generally on time for appointments?
 Yes..... No
35. Can you prepare a meal consisting of eggs, toast and coffee?
 Yes..... No

Note: In several of the following questions, you are asked to write briefly.

36. What hobbies (if any) do you have?

37. List the organizations of which you are, or have been a member (such as church groups, Y. W. or Y. M. C. A., sororities or fraternities, bridge clubs, study groups, professional or business clubs, or others):

38. If you hold, or have held, office in any club or organization, give the organization (s) and office (s):
- | Name of Organization | Office Held |
|----------------------|-------------|
| | |
| | |
| | |
39. When you are not under temporary regulations (such as sorority house rules, nurses' home regulations, etc.) how many evenings, in an ordinary week, do you spend with such groups as those just listed in questions 37 and 38?
 a. None..... c. 3 or 4.....
 b. 1 or 2..... d. 5 or more.....
40. A. In what sports, individual or competitive, do you participate (such as tennis, basketball, ping-pong, boxing, ice skating or any others)?

 B. How often, in an ordinary week, do you engage in the sports just mentioned in A? If it is a seasonal sport, such as ice skating, answer in terms of the time of year you are able to engage in it.
 a. 5 or more..... c. 1 or 2.....
 b. 3 or 4..... d. Less than once a week.....
41. Do you do (or attempt to do) any type of creative work (such as writing fiction or poetry, composing music, art work, etc.)?
 Yes..... No.....
 If the answer is yes, specify the type of creative work:

42. Have you received any recognition of the merit of your creative work?
 Yes..... No.....
 If the answer is yes, specify what recognition of merit you received.

43. Do you in any way supervise the work of others?
 Yes..... No.....
 If the answer is yes, how many people are under your guidance or supervision?.....
 To what extent are they under your guidance or supervision?.....

The items which purport to measure what has been referred to as the "independence" aspect of social maturity are 2, 3, 4, 5, 8, 9, 10, 11, 17, 18, 19, 29, 32, 33, 34, and 35. These questions seek to determine to what extent one is free from others. Learning the degree to which one participates in the larger social world, and shares in its obligations, is the aim of Items 1, 6, 7, 12, 13, 14, 15, 16, 20, 21, 22, 23, 24, 25, 26, 27, 28, 30, 31, 37, 38, 39, and 43. Numbers 36, 40*A* and 40*B* were included in order to see whether or not recreational activities may be employed as a satisfactory index of maturity. Items 41 and 42 are based on the assumption that some credit should be given for creative activity that meets with social approval, especially in view of the fact that pursuance of such leisure activities subtracts from the time available for social participation. The social contribution resulting from such pursuits is the objective of Question 42: "*Have you received any recognition of the merit of your creative work?*"

There are certain items calling for clarification. Item 1—"How many personal letters do you ordinarily write in a week?"—was included because correspondence is one means of maintaining social contacts. But one must bear in mind that responses to this item are affected by whether or not one is living at home. Naturally, the person living away from home has an additional reason to correspond with others. However, since Item 19 calls for the fact of residence, the effect of this may be ascertained. Item 30—"Do you know how to drive a car?"—was used because this ability might make for greater social mobility. True, the charge may be made that this item is heavily weighted with opportunity, that it is greatly dependent upon socio-economic status. Nevertheless, the writer feels that if such ability should increase social competence, its inclusion is legitimate.

As a matter of fact, many items of the test are dependent upon the factor of opportunity. But if by virtue of such overt behavior one is acting more maturely, then the use of such an item is justifiable, regardless of the cause. Illustratively, a blind person does not appreciate fine paintings. And though this lack of enthusiasm may be due to an inability to see, the brute fact remains

that he does not appreciate graphic art. Likewise, if such a "no-opportunity" factor makes for social incompetence, and Bradway (5, pp. 64-69) has found this to be the case with both the deaf and the blind, then the behavior of that person is on a low level of maturity, whatever the cause. The underlying reasons for the adjudged level of behavior are a distinctly separate matter.

One desideratum of the test was that it should have the quality of temporal economy, since its application in this instance called for the use of time donated by teachers, employers, etc. By actual try-out, the blank met this qualification, requiring approximately 20 minutes. This factor was found to be of considerable importance in gaining the co-operation of teachers, employers, and subjects.

Having determined the type of test desired, the writer made a list of all those questions that he and others thought might be used to indicate social maturity as they viewed it. The nature of the test, and the items constituting it, were considered carefully from several viewpoints. They were made the subject of much discussion with educators, psychologists, sociologists, graduate students, and various types of workers. Several seminar periods were given over to the discussion of the test. Certain points were clarified by correspondence with Worcester and others who have been interested in this area of research. The points of view of people from all social-economic classes were arrived at through conversation with a variety of skilled and unskilled workers, as well as the unemployed. The question of social maturity was discussed with social workers, personnel managers, and those connected with the Nebraska offices of the United States Employment Service. Items were eliminated only after careful consideration. Those that were retained met the approval of diverse groups as seeming to warrant investigation.

Before final printing, the 43 items that had been selected were mimeographed and tried out. Several revisions were found necessary, especially in the wording of the questions. First, the questionnaire was checked by having 20 randomly-selected people fill it out. These people were then quizzed as to what they thought had been called for, and what they thought was meant by such expressions as "close friend" and "expensive articles."

Administering a preliminary form of the test to a group of student nurses revealed, for example, that their customary behavior was impossible while living under the restrictions governing nurses homes. In order to get a truer picture of their ordinary social behavior, it was found necessary to reword Items 4, 25, 31, and 39, stating the behavior in terms of behavior at times

when not under temporary restraints. It was found advisable to explain Items 12, 16, 23, 33, 40*A*, and 41 by means of brief, parenthetic illustrations. Before final printing, ready understanding of the questions, and sufficient agreement as to the meaning of such phrases as "close friend" and "expensive article" was found to exist among the subjects. They voiced the belief that items were clear and definite. Many said they found taking the test quite interesting, a point decidedly in its favor, making for sincerity and close attention.

SUBJECTS AND TESTING PROCEDURES

The test was originally administered to the following 899 subjects: 517 college students, 66 employed men, 86 employed women, 18 unemployed men, 83 unemployed women, and 129 Civilian Conservation Corps enrollees. Of the 517 college students 334 were from the University of Nebraska, 74 from the University of Omaha, 42 from Creighton University, and 67 from the Peru (Nebraska) State Teachers College. Breaking down the University of Nebraska sample, the distribution of cases is as follows: College of Agriculture, 87; Arts and Sciences, 56; Business Administration, 2; Engineering, 22; Pharmacy, 8; Teachers College, 154; Dentistry, 2; Graduate, 3. Arranging all college females by school year, there are 98 Freshmen, 81 Sophomores, 90 Juniors, 51 Seniors, and 1 graduate student. Arranging the college males by year in school shows 85 Freshmen, 42 Sophomores, 42 Juniors, 25 Seniors, and 2 graduate students. The college group shows a greater number of females than males, due to the fact that many subjects are from teachers colleges in which there is a preponderance of female students. Table 1 gives the age distribution for all 899 subjects.

The age distribution shows the largest numbers of the college groups at the years 18, 19, and 20. The employed groups are more heavily distributed

TABLE 1
AGE DISTRIBUTION OF SUBJECTS

Group	Ages									Total
	16	17	18	19	20	21	22	23	24	
College Men	1	11	40	51	37	22	17	10	7	196
College Women	2	18	73	77	70	40	26	11	4	321
Employed Men	1		5	12	7	6	12	11	12	66
Employed Women	1	7	5	9	10	20	10	11	13	86
Unemployed Men	1	2	3	2	2	4	2	2		18
Unemployed Women		2	13	18	24	10	7	5	4	83
CCC Enrollees		20	32	31	20	14	7	5		129
Total	6	60	171	200	170	116	81	55	40	899

at the upper age levels. This is to be expected, since it is far easier for those at the upper end of the age range to find employment than it is for those below twenty. This also helps explain the large number of unemployed at year level 20 and below. The *CCC* cases fall at the lower end of the age range for the same reason. Although they are federally employed, they are so employed on the basis of inability to find private employment.

Although the cases are put into the categories of college students, employed, unemployed, and *CCC* enrollees, it is of interest that 20 per cent of the college men, and 5 per cent of college women, are employed part time. Among non-college groups are found sizeable numbers who go to night school or take special courses. No strictly dichotomous division on the basis of work or study exists among the groups. But since work is a part-time matter for the students, and study a part-time activity for the employed groups, our categories seem justified. It is interesting to note, however, that a higher percentage of the college men are employed part time than are college women, and that a higher percentage of the employed men are continuing to study than are employed women. Marriage, the expectation of marriage, social custom, are some of the factors which enter in to explain these occurrences.

The sample of employed people was obtained in the cities of Lincoln and Omaha, Nebraska. Some of the cases were obtained through the Lincoln Telephone Company, some through the Mutual Benefit Life Insurance Company, in Omaha, and some through the co-operation of an organization of business girls meeting at the Lincoln *YWCA*. The remainder of the cases were obtained through contacts with friends and acquaintances. The age range of the study was such that even in fairly large establishments there were relatively few employees of the ages desired. Occupations of the employed group were quite varied.

Although there did not appear to be any very definite figures as to the number of unemployed in the United States between the ages 16 through 24, most estimates indicated that at the time approximately one-third of all unemployed were within this age range. If this was the case, then there were between three and four million young persons of these ages who were unemployed. In any event, it was thought wise to include a sample of unemployed people, both because they are representative of large groups and because it would be of interest to see how they compare on a basis of social maturity with the college and employed groups.

The 101 unemployed cases were obtained through the Nebraska State Employment Service, both the Lincoln and Omaha branches. With this group,

it was found that several were employed at part-time *NYA* work. The Nebraska State Employment Service reports that odd jobs and occasional short-time employment is common among these cases. Since this is typical of the "unemployed" group, we feel justified in so labeling this group.

Approximately 300,000 youths were enrolled in *CCC* camps at the time of this investigation. A sample of this group was obtained because they represent a good percentage of young men within the age range of the study (41). The writer felt this group worth studying for yet another reason. These young men (who are federally employed and receive both cash and maintenance for their work) are drawn almost exclusively from the families of the unemployed, are themselves unable to find other employment. The writer thought it would be of interest to compare them with privately employed young men. The 129 cases of *CCC* enrollees were obtained at the Weeping Water, Nebraska, camp.

INTERPRETATION OF THE TEST RESULTS

After the tests had been administered, the responses of each of the 899 cases were entered on *IBM* cards. Subjects were separated into six groups: college men, college women, employed men, employed women, the unemployed, and *CCC* enrollees. Since there were only 18 unemployed men, and 83 unemployed women, the unemployed were considered as one group.

The test was largely validated on the basis of age differences. Since the definition of social maturity set up in this study defines it as the level of socially significant behavior attained at a given age, and since age differences were found to exist among the subjects, it seemed quite justifiable to use this means of test validation. As a matter of fact, this seems a far better method to employ than the method of associates' ratings, first because of the question of the competence of the judges (each of whom would tend to judge maturity against his own socio-economic background), and secondly because of the "marked inability to estimate accurately" which Doll (17, p. 289) found to be characteristic of judgments on subjects above 12 years of age.

At first, the responses of these six groups were tabulated by each age from 16 through 24. The data obtained by breaking the groups down into these nine year levels resulted in such a small number of cases at some ages that it was found advisable to rearrange the groups on some other age basis. So the subjects were placed in three groups which are as close to numerical thirds as it is possible to have them without breaking into one of the year groups. Group *A*, composed of 237 of the 899 cases, was made up of 16-, 17-, and 18-year-old subjects; Group *B*, with 370 cases, contains the 19- and

20-year-old subjects; and Group *C*, with 292 cases, consists of those 21 through 24 years of age.

Tables were set up giving the results of the testing in terms of percentages checking each of the choices of the questions, the six groups having been broken down into the three age categories just described. Results were considered in terms of percentages because, as has been pointed out, the age distribution of subjects varied considerably in the six groups.

Validation by means of age differences assumes an increase in social maturity with increasing age. That the *C* group behaves differently from the *A* group was apparent in the data. That these behavioral changes take place in the direction of greater maturity seems to the writer to be a safe assumption. The alternative assumption that these changes with increasing age are in the direction of less maturity certainly seems to be a less sensible one. That society in general makes the assumption of increasing maturity with age is seen in the facts that most states do not permit marriage without the consent of parents before age 18, and the right to vote is not given to youths until they have reached age 21.

Before assigning scoring weights to the test items, it was necessary to face the question of which group or combination of groups to use as a criterion. Because of the lack of adequate figures on the percentage of young people 16 through 24 who are unemployed, and because of the practical difficulties encountered in obtaining large groups of the employed, it was not found possible to set up as criterion a sample representative of the general population at these ages. One might point out the further weakness in this type of criterion arising from the fact that the various segments of the population do not exert an influence on social behavior patterns in perfect one-to-one correlation with their numerical size. Certain relatively small groups exert an influence out of all proportion to their numbers.

Evidently, assigning weights to the items using only one of our groups as the criterion would be taking the liberty of setting up that particular group as the desirable standard in social maturity. The writer could find no tenable basis for so selecting any single group. The criterion finally selected consists of a combination of all groups. The average of the group percentages was the basis. This procedure has the merit of permitting each of the groups (and each of the sexes) to have equal influence in determining the weights used in scoring them. Since the obtained data show much variation of trend in the different groups, this seemed to be the most satisfactory procedure to employ.

The scoring weights assigned to the items are derived by means of the

Kelley-Strong² formula for the comparison of percentage differences between two groups, in this case youngest and the oldest of three age groups. Application of this formula to the obtained differences between these two groups results in a zero weight on all parts of Items 1, 14*A*, 21, 30, 32, 34, 36, 38, 40*A*, 41 and 42. (Item 43 was not found usable because of misunderstanding of the question on the part of subjects. It was found that many had classified such things as teaching a Sunday School class, or tutoring a pupil once a month, as supervising the work of others.)

ITEMS RECEIVING ZERO WEIGHTS

It is of interest to note the 11 items found by our procedures to show changes of zero weight. The number of personal letters written in an ordinary week does not appear to be a type of behavior changing with increasing age from 16 through 24 when all groups are considered equally. Among employed men, however, our data show a marked decrease between Groups *A* and *C* in the percentage writing three or more letters per week. In this instance, as in many others, the weighting procedure employed tends to reduce differences, and often to obscure the differences to be seen in a particular group of subjects.

The number of very close friends of the same sex does not show any marked change with age when groups are combined. But among employed men we note a tendency for the number having one or two very close friends of the same sex to increase, with a decrease in the percentage having three or four. Among the *CCC* enrollees, on the other hand, is seen a drop among those having one or two close friends of the same sex, with a definite increase in the number having three or four. Considering that the two groups are in such totally different environments, the *CCC* enrollees being in constant association only with members of the same sex, this difference is not surprising. In the case of this item we see that averaging the group percentages has a tendency to show no trend when two conflicting trends exist, as they do here.

Item 21, concerning one's helpfulness in emergencies, also has a zero weight in the test. But there is seen a slight tendency for the college groups to show an increase in this behavior with increasing age, whereas the employed and unemployed show a reverse trend.

Item 30, which asks whether or not the subject knows how to drive a

$$^2W = 4N \frac{\Delta}{1.4 j \Delta^2}$$

car, also did not meet the difference criterion. There was observable, however, a tendency for the percentage of employed women who know how to drive a car to increase noticeably, while the unemployed group (mostly women) shows a decrease. This is perhaps due to the economic differences between these two groups. The financial status of the employed women has a tendency to improve, while that of the unemployed becomes worse with time.

Item 32, which asks whether or not one likes to have assistance in getting dressed for special occasions, is also characterized by conflicting group trends. The college groups and the unemployed show a tendency to an increase with age, while the employed group shows a decrease. Why these opposite trends exist is not, of course, discoverable from the data. The explanation may very well be that college life, in which youthful persons of the same sex live in groups larger than is the case in family life, presents more opportunity for developing a dependence on others in getting dressed for special occasions.

In Item 34—"Are you generally on time for appointments?"—no marked tendency is seen for this type of behavior to change with age. The slight tendency for college women to increase in punctuality is opposite from the trend in employed women. Time available may be a factor. This does not appear likely, however, since employed men show a definite increase in punctuality with age.

Comparison of those who have hobbies with those who have not (Item 36) gives a zero weight for the average of the groups. But a tendency is noted for the percentage of college and employed men who have hobbies to decrease with age, whereas college and employed women show an increase. Both the unemployed and CCC groups show a tendency to decrement. Opposite trends of the sexes in college and employed groups were discovered.

When those who hold, or have held, as many as two offices in clubs or organizations (Item 38) are compared with those who have held less than two offices, no consistent trend with age is seen, except in the case of the college women. Combining groups gave differences too small for weighting this item.

In Item 40A, comparison of those engaging in as many as five sports with those engaging in less than five resulted in combined differences of zero weight. The only decided tendency seems to be for the employed and unemployed cases to show a decrease. The rise among CCC youths is very likely due to organized play opportunities, and emphases of camp directors.

Items 41 and 42, relative to whether the subject does, or attempts to do,

creative work, and whether he has received recognition for such work, born give zero weights. Item 41 does not seem to have much discriminative value on other than college groups. Among college students, there is a definite tendency for the percentage attempting creative work to increase with age. Apparently, the collegiate environment is most conducive to creative efforts.

ITEMS ASSIGNED SCORING WEIGHTS

Turning to those items which do receive scoring weights when groups are combined, one finds that (Item 2) those who go alone to nearby places *frequently, rarely, or never* receive weights that are lower than those who go *occasionally*. Seemingly, the mature person goes to nearby places alone, but does not do so very often. In this and following items, it is seen that the favorable score goes to the person who is extreme neither in his action nor inaction with respect to socially significant types of behavior. Our empirical scores, as had been expected from the discussion of social maturity in the early pages of this paper, penalize those who deviate too far from a behavioral mean. The mean itself differs, of course, with the behavioral element considered.

In Item 4, the most favorable weight is given to the person who *frequently* goes out at night unrestrictedly, neutral weights to those who do so *occasionally* or *rarely*, and negative weights to those who *never* do so. We are justified, therefore, in considering the degree of independence from others as one index of social maturity.

Item 5 results show that one who goes alone to buy his clothing accessories is more mature than that one who takes others along. Why it is that those who *almost always* take someone along to help select clothing accessories receive a lower score than those who never go alone is not clear. It may be that those who *never* go alone are without choice in the matter,—there may be some parent who dominates the situation completely,—whereas the one who *almost always* takes someone along to help select clothing accessories does so even though there is some choice on his own part.

The favorable score on Item 6 falls to the person who *occasionally* does shopping for articles of small cost for others. *Frequently, rarely, and never* all receive equivalent low weights. The low weight for *frequently* may be due to the fact that a mature person will occasionally do such things for others, yet will not permit himself to be so frequently imposed upon as to become a mere errand boy for others.

The data on Item 7 would indicate that the mature person *never* does

shopping for expensive articles for others; yet the one who does so either *frequently* or *occasionally* is more mature than the one who does so *rarely*. Scrutiny of the data shows the inconsistency of the weight for *never* may be partly due to the conflicting trends of the sub-groups. There is a decrease in the percentage of college students responding *never*, and an increase in the non-college groups.

Those who have bank accounts (Item 8) receive favorable weights; those who do not receive negative weights. There is a positive trend with respect to this type of behavior in all groups. It is worthy of comment that the increase with age is just as noticeable, if not more so, among the unemployed. This item, then, is not too heavily dependent upon the opportunity factor.

That those who behave in the present with some regard for their own future welfare are more mature than those who do not is shown by the fact that those who provide for the future (Item 9) receive favorable weights, while those who do not receive negative ones. This is in keeping with the results of the question of having regular checkups on one's physical condition (Item 33) which is another means of looking to one's future welfare. Item 33 gives a rather high positive weight for those who periodically seek medical and dental checkups. It is an even more discriminating item than Item 9.

Our weighting indicates that the mature person does, or is preparing to do, a type of work *entirely* of his own choice or selection (Item 10). Those who are acting in accordance with the pressure of circumstances are less mature than those whose choice is due either *partly* or *entirely* to the wishes of others. Seemingly, the immature person is more likely to be forced by circumstances into a given field of work. The independence of others on the part of the mature person is again brought out by this question.

A very favorable weight is given the one who is *entirely* in charge of his own major expenditures of money (Item 11). Yet the one who has no control at all over his major expenditures of money receives a weight which, though lower, is nevertheless better than the weight given those who report slight or partial control. One might suggest an explanation similar to that given for the results of Item 5: the one who has no control may be without any voice in the matter, while the one who has a partial control is partly directed in his expenditures even though he has some right to speak in the matter.

It appears that those who are mature *occasionally* assume responsibilities beyond their own needs (Item 12), yet do not do so *frequently*. Quite likely, the mature person is willing to assume responsibilities, but not to the extent of neglecting his own individual needs. That deviations to both extremes are

alike unsatisfactory is shown by the low weights given those who assume such responsibilities *frequently*, a weight exactly equal to that given those who *never* do so.

Contributing to the support of others in one's family (Item 13) differentiates the groups. All groups show an increase with age in the positive direction, with the exception of the *CCC* enrollees. Why this particular group shows a decrease with age is not clear. It might be conjectured that the older *CCC* youths, with no more income than the younger enrollees, have need for more personal expenditures, such as "dates" and cigarettes, thus leaving less to be contributed to support of the family.

Although the question of the number of very close friends of the same sex did not reveal age differences, the number of such friends of the opposite sex does (Item 14). Maturity is characterized by one or two close friends of the opposite sex. The person who has five or more is less mature than the person with either none or three or four. One might suggest the explanation that having settled down to one or two friends of the opposite sex is a sign of adulthood, and that the extreme of "shopping about" is an even more adolescent characteristic than not "shopping about" at all. At least, the obtained weights are more flattering to the misogynist than the philogynist. The educational implication here is that it is better not to encourage interest in the opposite sex than to overly encourage it, at least with respect to the number of such interests.

Our weights indicate that those who contribute to the church (Item 15) *regularly* are less mature than those who contribute *never*, *occasionally*, or *quite often*. Those who contribute *rarely* receive the most favorable weight. That this is not due to the nature of the subject is indicated by the fact that an opposite trend is found in Item 16—"Do you contribute to other *philanthropic agencies* (such as Community Chest, Red Cross, etc.)?" With Item 16, the mature contribute *regularly*; the less mature respond with *never* to this question.

Several explanations are possible for the fact that the older subjects do not contribute to the church. First, those in the lower end of the age range are still at home, still members of a church in which they feel "at home." The older subjects, a large number of whom are away from home, may not as yet have become members of a church away from home. It may also be that family life is more conducive to church attendance than life away from home. Secondly, it may be the case that the younger of the subjects receive a certain allowance from their parents for church contribution, while the older are more self-supporting,—yet less inclined to give of their own earnings. These

same members of our *C* group may, after they have children of their own, become regular attendants at church. But whatever the case may be at other ages, the fact remains that our older subjects do not contribute as often as do the younger. The differences between Items 15 and 16 may be due in large measure to the fact that contributing to the Red Cross, the Community Chest and such philanthropic agencies is not the result of membership as is the case with the church, and contacts are made through the home, the school, and business instead of through a single institution.

Those who have earned *all* their own living expenses (Item 17) receive a very high score for the item. Those earning *none of them*, *spending money only*, or *some of them*, all receive negative weights for this item. It is to be observed that the direction of change with this type of behavior is the same among college students as it is among the employed. In every instance, likewise, we see that the percentage finding it hard to make decisions alone decreases with age (Item 18). This same independence of others in earning a living away from parents and relatives is reflected in Item 19 also. The mature person is living away from parents and relatives. The person who is away from parents and relatives, but in the same city, is somewhat more mature than those living with either parents or relatives. The greater the independence from the family, the greater the degree of social maturity of the subjects.

Responses to Item 20 reveal that the older group consider themselves more capable of inspiring confidence in others. Only in the case of the unemployed group is a reverse trend found. This may be because people place little confidence in those who are unable to secure the independence of employment.

Those who are *frequently* consulted in matters requiring good judgment or leadership (Item 22) are more mature than those who are consulted *occasionally*, *rarely*, or *never*. The explanation for this might possibly be that the person who is asked *rarely* or *never* for counsel has little or no opportunity to become one of those *frequently* consulted. The one who is consulted *occasionally* does have this opportunity, yet may not become a person *frequently* consulted because the nature of his counsel has not been found to warrant it. Again, it must be pointed out that these suggested explanations are mere hypotheses, since there is nothing in the data themselves to indicate reasons for the behavior.

We find that the high maturity score goes to the person who follows current events fairly regularly, but without continuity. The person who reads the news *daily* or only *now and then* is more mature than he who almost

never reads the news. So the mature person is one who reads the news *fairly regularly*, not *daily and with continuity*. Quite likely, the social contacts of the mature interfere with the daily and continuous perusal of the news. Those who are not at all interested in the news (which is usually but the account of occurrences among one's fellow humans) are least mature.

Item 24 reveals that those who are more mature are capable of enjoying picture shows, lectures and the like when they go to them alone. Apparently, their enjoyment of such things does not depend wholly upon companionship. Although they are much more inclined to be interested in group affairs, they are not so dependent upon group activities that they cannot enjoy shows and lectures if they go unaccompanied. This is also evident in Item 25, which reveals that mature persons stay at home one or two evenings per week (without guests or visitors). The persons who stay at home without guests *three* or *four* evenings per week are less mature than those who *never* do so, or those who do so *five* or *six* times per week. Again, one might conjecture that the person who stays at home five or six times per week without company may be the person who has no choice in the matter, because of an almost complete lack of opportunity.

Yet the mature person, who is capable of enjoying going alone to shows, seems to go *less than once a week* (Item 26). Social interests may result in lack of opportunity, or be sufficient to indicate a preference for more social participation than theater attendance. The fact that the person who goes *about twice a week* is less mature than the one who goes *about three times a week* may, again, be due to the lack of choice or opportunity for a more social type of activity.

We see that the person who is mature *rarely* answers newspaper, magazine, radio or catalogue ads. Yet those who do so *frequently* or *occasionally* receive a higher score than those who *never* respond. Consistency, however, is to be seen in the fact that those who are most mature are also most cautious in such behavior, while those who never find such action profitable are perhaps at an extreme more indicative of inaction than caution. It may well be that frequent or occasional reply to such ads reflects less caution and more gullibility than accompanies maturity.

The data show that the percentage who have had "blind dates" in order to accommodate friends or relatives (Item 28) tends to increase with age in the case of all groups excepting employed men. It is also to be noted that the possession of a charge account in one's own name, or one that can be used, goes with maturity (Item 29). Having a charge account results in a weight even greater than that for having a bank account.

The person who attends dances *occasionally* appears to be more mature than those who go either *frequently* or *never* (Item 31), while the one who goes only *rarely* receives the lowest weight. Again, the one who goes rarely may have some choice, while he who never goes may not.

That mature persons can, if necessary, prepare a simple meal for themselves, thus displaying a measure of independence in food preparation, is revealed by the responses to Item 35. The results of this question do not show the sex advantage one might expect in view of the fact that food preparation is generally considered a feminine prerogative. Sex differences would probably be greater in the case of more skilled food preparation than the type we have used here.

Those belonging to more than three organizations (Item 37) are more mature than those belonging to fewer than three. And although the holding of offices does not seem to be an indication of maturity (Item 38), the extent of one's attendance does (Item 39). The one who attends such groups *once or twice a week* is more mature than the one who goes *three or more times per week*, while the one who *never* attends such groups is least mature. It seems that frequent attendance is preferable to non-attendance, while attendance once or twice a week is preferable to frequent attendance. Those who go three or more times per week may fall in the category of persons who are participating beyond the degree in keeping with their own personal good interests.

Greatest maturity in sports activities goes with participation less than once a week (Item 40B). Those who participate *once or twice or five or more times per week*, receive a higher weight than those who do so *three or four times per week*. This paradoxical state of affairs resembles the results of the questions on movie attendance and going to dances, and may find its explanation in the same reasons.

Certain facts should be emphasized with respect to the test items and the weights given them. First, it must be remembered that had our weights been developed according to the behavior of any single group, they would be different from those found through using a combination of all groups as the standard for scoring. This is but another way of saying that maturity may take one direction with college students, another with employed, unemployed, or CCC groups. The writer used a combination of all groups simply because it seemed the fairest basis for group comparisons. For that reason, the writer has pointed out in the discussion of the items, major instances of opposed group tendencies.

Secondly, our items (and the choices within items) may show zero weights

simply because the conflicting group trends equalize each other. In Item 20, for example, we find a tendency to an increased percentage with age among college students and CCC enrollees. When combined with employed and unemployed percentages, which show an opposite trend with increasing age, we obtain zero weights for this question. Had we used our college groups alone as the criterion, this item would have given a positive weight for a "yes" response, and a negative weight for a "no" response. Combination of an upward with a downward curve has resulted in a straight line.

Thirdly, it should be recalled that only the youngest and oldest age groups have been used for comparison. The behavior of the *B* group (19 and 20 years of age) is frequently not in keeping with the trend between Groups *A* and *C* considered alone. There may be several causes for this phenomenon. It may be that the age differences between Groups *A* and *B*, or *B* and *C*, are not sufficiently great to show the trend. In some cases, it may be due to the fact that certain types of behavior reach a peak at ages 19 and 20, then proceed to decrease. With other types of behavior, changes may not begin to take place until the age of 21. Differences with respect to age Group *B*, as well as the conflicting trends between groups, may be a resultant of the fact that a level with some types of behavior is reached at one age in one group, and at another in others. In some items, and in some groups, seeming inconsistency may be due to the fact that some of the cases are approaching maturity while others are either on a temporary or permanent level, while yet other cases may have passed age of maximal behavior and show a decrease.

It has been suggested by J. P. Guilford that one explanation for the claims of the younger that they indulge in more of a "grown-up" activity than the older groups is that they tend towards a compensatory sort of overstatement. The older ones do not feel it necessary to make a "grand showing" in activities in which they have been normally indulging for some time, whereas the younger ones may feel inferior because they have not been able to indulge as much as they would like. He also suggests the further possibility that when new activities are undertaken there is an initial period of overindulgence which is later followed by satiation and a reduction in the amount of activity.

The data simply show how the groups behave at the different age levels. We do not have anything in the data to indicate the nature of this behavior at age levels other than those of our study; nor do the data themselves present reasons for such behavioral changes or lack of change. The explanations given are but an attempt on the part of the writer to find logical reasons for that which has been found to occur. An estimate of test-retest reliability

was made (with a week's intervening interval) with a group of 42 students at George Washington University. The coefficient of reliability obtained was .88, with a *PE* of .02. The standard error of measurement was 2.34, which is 28.5 per cent of the standard deviation of this limited group. An external check on the assumption of increasing score with age was made, the test being administered to a group of 100 subjects made up of college students at St. Louis University and employed persons in Washington, D. C. Linear correlation of scores with chronological age was .55, with a *PE* of .047. The correlation ratio for the regression age-on-scores was .54, and for the regression scores-on-age was .61. Because there is naturally considerable spread of social maturity at any age level, higher correlations with chronological age should not be expected. Additional evidence of validity is seen in the table of group comparisons below.

GROUP COMPARISONS IN SOCIAL MATURITY

Because of differences in the age distribution of the groups, comparisons between the totals of the groups would not be a fair basis for ranking them with respect to social maturity. Since the largest number of cases are found at 19 and 20 (*B* group), and since this age category also presents the smallest spread of the three, comparisons are based on the cases at these years. Ages 19 and 20 are at about the middle of the age range used in this study. These particular ages, furthermore, were not used in obtaining the scoring weights.

TABLE 2
TABLE OF GROUP RANKINGS

Kind of group	Mean	SD	Mean social age	Critical ratios		CCC
				Employed	College	
Employed	46.3	7.2	21.2	—	—	—
College	44.3	6.3	20.0	1.6	—	—
CCC	42.7	5.4	19.2	2.6	1.8	—
Unemployed	39.4	5.7	17.7	4.6	4.7	2.8

The *CR* of 1.6 which is found between the scores of the employed and college groups indicates that the difference between these groups is not statistically significant.³ The *CR* between the CCC and college groups is 1.8, showing only a slightly significant superiority on the part of college students.

³Interpretations of the *CR*'s are based on the *N*'s being compared as well as the size of the *CR*'s themselves (see Guilford, 25, pp. 548-9).

Comparison of unemployed and college students reveals a very significant superiority on the part of college students, the *CR* being 4.7.

The *CR* of 4.6 between the employed and unemployed shows a very significant superiority of the employed group over the unemployed with respect to social maturity. A fairly significant superiority is found to exist on the part of *CCC* enrollees when they are compared with the unemployed group, the *CR* being 2.8. The *CR* of 2.6 obtained between the employed and *CCC* groups indicates a fairly significant superiority on the part of the employed.

With reference to the *CR*'s found to exist between the groups, it may be said that with one exception they have statistical significance. It should also be pointed out that our procedures have tended to minimize differences between groups. Basing weights on the composite of group responses has this influence, as well as the procedure (used here) of determining the significance of differences (degrees of freedom) in terms of the smaller number of cases whenever comparing two groups.

Tables giving age and centile norms, by sex, for all subjects, and college year norms for the students, have been elsewhere presented (36). A consistent growth curve further substantiates the validation assumption of increase with age, since it is apparent even in the cases not used in the assignment of weights. The "levelling off" at the upper ages of those studied indicates either that these behavioral aspects have reached full maturity by 23 or 24 years of age, or that the test fails to assess those social aspects which do show growth beyond these years. There is the further possibility that these phases of social development are at a temporary standstill at this point on the age continuum.

CONCLUSIONS

Bearing in mind that the subjects of this study were (with the exception of those used in determining the reliability and making an external check of validity) resident in the state of Nebraska, and may therefore not be representative of young persons in general, the writer has arrived at the following conclusions with reference to the relative standing in social maturity of the groups investigated.

1. The charge that college students are less mature socially than other young people of the same ages is not justified. No significant difference was found to obtain between college and employed youths.
2. There appears to be a very significant superiority of college students over the unemployed.
3. College students show a slightly significant superiority over *CCC* enrollees.

4. There is a significant superiority of employed youths over the unemployed and CCC groups.

5. The CCC group, though below the employed and college youths, show a significant superiority over the unemployed.

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A COMPARATIVE STUDY OF THE INTELLIGENCE OF JEWISH AND SCANDINAVIAN KINDERGARTEN CHILDREN*¹

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A. INTRODUCTION

This study does not purport to deal with "Race differences." The term "race" is no longer regarded as a valid classificatory device by many sociologists and anthropologists, and its use is generally restricted to discussions in which a convenient abstraction is needed. As Linton (23) points out, "Races . . . are creations of the investigator and creations with regard to which all its creators are by no means in agreement." Garth (13) offers a succinct view of the problem from a psychological standpoint when he declares:

. . . after an examination of the literature . . . we have never, with all our searching, found indisputable evidence for belief in mental differences which are essentially racial. Differences as found can usually be shown to be due to one of two causes modification (nurture) or selection and often these are complicated by the results of careless testing.

Klineberg's (21) critical opinion is that ". . . there is no scientific proof of racial differences in mentality." He cautiously suggests that such differences may ultimately be demonstrated by as yet undiscovered techniques, although "in the present state of our knowledge . . . we have no right to assume that they exist." It would seem therefore that most of the measured differences between so-called "races" should be attributed to cultural rather than somatic influences.

Assuming for the present that such a view represents the consensus among social psychologists, it does not preclude the necessity for continued research in this area. The concept of individual differences is basic to a democratic culture and the manner in which such differences arise is of the utmost impor-

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tance to the social and educational psychologist. In approaching this problem we assume that a social group is a relatively homogeneous aggregation of individuals in which certain traditionalized standards, values, and attitudes toward life make an early impression upon the mental development of members within the group. Studies of this type, i.e., of cultural differences between social groups as such differences may be reflected in responses to the items of an intelligence test, may throw light upon adventitious learning in the young child. They may also indicate more clearly how cultural patterns are interiorized. In this respect our orientation deviates sharply from the generally implied assumptions of mental "superiority" and "inferiority" of peoples. We assume that every individual in any social group within our highly diversified American culture occupies a significant position in terms of his social and economic worth. It is with this timely conviction that the following study was undertaken.

B. PREVIOUS STUDIES

Pintner and Keller (30) studied the influence of language handicap upon mental test performance of 79 Jewish and 367 English-speaking children in the kindergarten, first, and second grades. No differences in intelligence were discovered upon the basis of scores obtained on their own forms of the Binet which correlated .97 with the Stanford revision. Graham (16) compared 47 Jewish with 60 Italian problem children in the habit clinics of the Massachusetts Division of Mental Hygiene. The Jewish children (mean *CA* 69 months) earned an average *IQ* of 105. The Italian children (mean *CA* 76 months) obtained an average *IQ* of 99. Socio-economic level was not controlled. Goodenough (15) compared 55 Jewish with 500 non-Jewish children on the Draw-a-Man Test. Jewish children were less variable in their responses and made higher scores on the test than did non-Jewish. The mean *IQ* of the Jewish group was 106. The mean for 31 Scandinavian children was 105. This is interesting in view of the assumed inferiority of Jewish children on tests involving motor co-ordination (3). Seago and Koldin (32) found Jews to be "significantly superior" to Italians on the National Intelligence Test. Murdock (27) compared Jewish with native white children between 9 and 15 years of age on the Pressey *Group Intelligence Test*. The two groups overlapped 53 per cent. Berry (5) used the Detroit Primary Intelligence Test on Yiddish-speaking and native white children in the 1B grade and found that the former made lower scores on the test. Bere (4) found that Jewish children surpassed East European, Bohemian, and Italian children on the Binet and

National Intelligence tests. Brill (7) summarized English and American studies up to 1930 and came to the following conclusions;

1. Jewish children in Great Britain and the United States were found to be superior or at least equal in intelligence to non-Jewish children of similar socio-economic status. (*This important variable was adequately controlled in only three out of twenty-three papers!*)
2. Jewish children were found, in most cases, to be superior to the children of other foreign-born racial or national groups, notably those of Italian and Central European stocks.
3. Distribution of intelligence was found to be more homogeneous for Jewish than for non-Jewish groups.
4. As to the difference between Jewish and non-Jewish children in non-verbal intelligence, there are not sufficient data to warrant conclusions.
5. The problems of the difference between Jews and non-Jews in average general mental level, variability of the distribution, frequency of the mentally superior and inferior, growth of general intelligence and manual ability are still open to rigorous research.

Pintner (31) points out that immigrants (non-Jewish) from Northwestern Europe give good accounts of themselves on intelligence tests. This was corroborated by studies in which immigrants from Great Britain, Holland, Germany, and Scandinavian countries made higher scores on mental tests than did those from Eastern Europe. Concerning the non-verbal performance of Jewish children, Halpern (17) reports that Jewish children in her study earned a Stanford-Binet *IQ* of 96.2 and a Pintner-Paterson *IQ* of only 81.5. Klineberg (21), in commenting upon this, remarks, "There is among Jewish families such a marked emphasis upon schooling and 'abstract' intelligence to the almost total disregard of manual dexterity and mechanical intelligence that this result was really to be expected." If this statement is correct it would be interesting to discover how early in the child's life such characteristics manifest themselves.

The question of bilingualism in relation to success on verbal tests of intelligence has frequently been raised. This is especially relevant in connection with scores obtained by children of high and low socio-economic status, where it might be assumed that the latter may be at a disadvantage on verbal tests because such children are more often bilingual than are those from more acculturated homes. Pintner and Arsenian (29) found no significant differences when they compared 469 native-born Jewish children of both sexes in Grades VI to VIII who were matched for socio-economic status, divided into high and low bilingual groups, and compared as to their performance on the same intelligence and performance tests. These groups

were evidently not selected upon the basis of their representation in the general population. Arsenian (1, 2) compared 1,152 Italian and 1,196 Jewish native-born children who were equated for age, sex, and socio-economic status. He concluded: "Bilingualism does not influence, favorably or unfavorably, the mental development of children nine through fourteen in the various groups studied in this investigation." There are no data to indicate whether bilingualism influences scores on verbal tests at younger ages, therefore this factor ought to be controlled in all studies dealing with younger members of a social group.

Our brief survey of the data on general intellectual level of Jewish children suggests that many generalizations pertaining to this subject rest upon inadequate foundations. The following most common methodological faults were found in our study of the literature in this field:

1. Failure to control socio-economic status.
2. Failure to present evidence to show that reading disability cases had been eliminated.
3. Failure to control language handicap.
4. Failure to weed out problem children (clinic cases) and to deal only with normal unselected groups.
5. Insufficient number of cases.
6. Use of broad chronological-age distributions, thus neglecting such factors as test sophistication and life experiences which may influence successes and failures on the test.
7. Failure to use adequate statistical techniques in analyzing group factors. In many studies the fullest meanings of the data have not been extracted.
8. Failure to define clearly what is meant by the "non-Jewish" category, i.e., assuming homogeneity for non-Jewish groups (24).

C. THE GROUP

Our selection and distribution of socio-economic levels was based upon the percentage of gainfully employed adults in Minneapolis classified according to the Goodenough-Anderson scale of occupations (1930 census data) (14). Our experimental sample of Jewish and Scandinavian children followed this distribution very closely (Table 1). We were unable to meet the percentage requirements in Group VII for the Jewish group because Minneapolis Jews are not well represented in this category. This raises a serious question as to whether our Jewish sample is at all representative of the Minneapolis non-Jewish distribution and whether Jewish groups elsewhere follow a distribution similar to the one which we have set up in this

TABLE 1
OCCUPATIONAL REPRESENTATION AND SEX DISTRIBUTION OF JEWISH AND SCANDINAVIAN
KINDERGARTEN CHILDREN USED IN THIS STUDY

Occupational level	Jewish			Scandinavian			Total S & J	M'pls. Sample	Experi- mental Sample**
	M	F	Total	M	F	Total			
I. Professional	6	8	14*	8	6	14*	28	4.2%	4.4%
II. Semi-profes- sional and managerial	20	15	35	16	17	33	68	10.0%	10.6%
III. Clerical, retail business skilled trades	45	36	81	25	57	82	163	22.9%	25.0%
IV. Farmers								.2%	0.0%
V. Semi-skilled minor clerical minor business	82	64	146	60	86	146	292	42.6%	45.0%
VI. Slightly skilled workers	14	11	25	7	18	25	50	7.6%	7.8%
VII. Unskilled laborers	11	12	23	15	8	23	46	12.5%	7.2%
Total	178	146	324	131	192	323	647	100.0%	100.0%

*Level I was held to 28 cases for the total group comparison but consisted of 50 cases for greater reliability in computing variances. This explains the apparent discrepancy between these totals and those given in Table 5.

**Since the Jewish and Scandinavian representations are identical we have not considered it necessary to give separate percentages for each group. Both groups are included in the figures for the experimental group.

study. Since this is no triviality from a methodological standpoint we believe further treatment of this point is warranted.

To what extent do Jewish occupational distributions deviate from those of non-Jews and what bearing does this have upon the question of Jewish intelligence? If there are more Jews in the upper levels of the occupational scale would this indicate that Jews have higher intelligence and/or there are more intelligent Jews than their representation in the population would warrant? Jaffe (20) studied the occupational classification of Jews in Chicago who had died between 1928 and 1932 (Table 2) and concluded that "the preponderance of Jews in the white-collar classes is clearly evident from the data." Meyer (26) found a larger number of Jews in the professional and white-collar groups than in the industrial groups.

Köhler and Anderson (22) completed a survey of 20,000 Minneapolis families residing in 10 settlement house districts. Data were obtained on the occupations of 1,309 Jewish employed heads of families which we have classified according to the Goodenough-Anderson scale (Table 3). These

TABLE 2
OCCUPATIONAL CLASSIFICATION OF MALE JEWS WHO HAD DIED (1928-1932) IN CHICAGO.
N = 100₍₂₀₎

Occupational level	Per cent Jews	Per cent total male population
Professional	9	5
Proprietors and managers	48	62
Industrial workers	42	62
Miscellaneous	1	3

TABLE 3
OCCUPATIONAL DISTRIBUTION OF JEWISH AND NON-JEWISH EMPLOYED MALES IN
MINNEAPOLIS

Occupational level	Per cent Jewish	Per cent Minneapolis distribution
I	6.1	4.2
II	10.5	10.0
III	20.8	22.9
V	45.0	42.6
VI	15.7	7.6
VII	1.7	12.5

figures show, surprisingly enough, that the major differences lie at the extremes of the distribution, although the predominance of Jews in the white-collar classes is substantiated. This table also shows why we had difficulty in obtaining a sufficient number of Jewish children for our Group VII sample. The relative similarity of our Jewish and Scandinavian populations, however, warrants the manner in which the selection was made.

One might justifiably question the wholesale application of the known relationship between socio-economic status and intelligence to problems involving large social groups. We are hardly justified in assuming that white-collar workers are more intelligent than are industrial workers. We can only say that the former are likely to earn higher scores on verbal tests of intelligence. We stress this point because it is often assumed that societies disperse themselves into strata largely upon the basis of individual differences in general intelligence. There is no incontrovertible proof of this assumption. In the case of the Jew one must consider occupational selection not only in terms of intelligence but more logically as an outgrowth of certain persistent social and economic imperatives. The centuries-long urbanization of the Jew, arising out of the old-world complex of land-status which excluded him, resulted in a socially conditioned sensitivity for language which has apparently been transmitted as a culture value. As the individual grows farther away from the land and from artifacts, he appears to develop a

greater need for symbol mastery. The immigrant Jew arrived in America and joined those individuals who had already formed a nucleus in large urban centers. These earlier immigrants had come to America with no expectation of owning or working land, since it had no place in their tradition-dominated anticipations. The need for status among members of a minority group imbued with the need for security naturally impelled them toward those occupations which offered such security. The clearest proof that occupational distribution of the Jew may be culturally rather than intellectually or consciously determined may be seen in the creation in Palestine of an agricultural commonwealth built by former Jewish urban "intellectuals." The extent to which cultural forces will influence vocational choice and achievement is well demonstrated in Terman and Ogden's (35) report on the California gifted children after 16 years. They compared the 167 most successful with the 146 least successful, dividing the upper and lower quarters into groups designated as "A" and "C." In referring to the Jewish children they remark:

There is a marked difference in the composition of the two groups; the "A" group includes nearly three times as large a proportion of Jewish subjects. The figures are 14.3 per cent for the "A's" and 5.3 per cent for the "C's" as compared with 10.5 per cent for the entire California gifted group. The Jewish child is under heavy pressure to succeed, with the result that he achieves more per unit of intelligence than those of other racial stocks.

This study is noteworthy in that it compares the socio-economic altitude of individuals from different social groups while maintaining the intelligence factor as a constant.

Homogeneity of chronological age was satisfactorily controlled in our study (Table 4). Nationality was ascertained from test blanks and verified

TABLE 4
SIGNIFICANCE OF THE DIFFERENCE BETWEEN MEAN CHRONOLOGICAL AGES AT EACH
OCCUPATIONAL LEVEL FOR JEWISH AND SCANDINAVIAN CHILDREN (IN MONTHS)

Occupational level	N	Jewish Mean		Scandinavian Mean			Diff.	
		CA	SD	N	CA	SD	SD _{diff.}	SD _{diff.}
I	25	67.9	4.12	25	68.9	2.52	1.14	0.87
II	35	68.7	2.62	33	68.5	3.57	.75	0.26
III	81	69.1	4.32	82	69.0	3.57	.72	0.13
V	146	69.1	3.20	146	69.7	3.70	.38	1.57
VI	25	68.8	1.81	25	69.6	3.44	.83	1.44
VII	23	69.7	3.87	23	70.3	2.77	.97	0.61
Total	335	69.1	3.56	334	69.4	5.19	.26	0.15

in all questionable cases by further information. Father's occupation was traced through the city directory and school records. All children who exhibited speech difficulties, extreme shyness, negativism, or other indications of unfavorable personality or sensory development were eliminated from this study. All children retained as subjects for the experiment were second-generation offspring who were presumably equated in whatever language handicap might have operated. We believe therefore that all factors other than intelligence were adequately controlled.

D. PROCEDURE

Both Jewish and Scandinavian subjects were tested by their teachers during the last semester of the kindergarten year. Teacher-testers were given four preliminary lectures in the administration and scoring of the 1916 Revision of the Stanford-Binet Scale up to Year X. Teachers tested six children, keeping full verbatim records, and were observed in the testing situation. Testing was continued until 20 more children had been examined, when another observation test followed. Careful records of the teacher's technique, rapport, scoring ability, and general proficiency (8) were kept until the results were definitely established as accurate. A teacher was certified as proficient in testing kindergarten children when: (a) she had tested at least 75 subjects, (b) her test administration under supervision was practically errorless, (c) errors in scoring and mathematics had been reduced to a point where there was almost never more than two or three points difference in *IQ* between teacher's and psychologist's scoring (9).

Statistical studies of teacher testing reliability produced uniformly satisfactory results. Hilden (18) retested 274 teacher-tested children after a period of one year and obtained a correlation of .89 with a probable error of estimate of 4.7 *IQ* points. The middle 50 per cent of differences fell between +5.5 and -3.7 points. The author (9) retested 201 children after a mean interval of 2.62 years and obtained a correlation of .860 with a probable error of estimate of 5.6 points. These findings were in close agreement with Merrill's data (25) on a similar group of children referred for re-examination at the teacher's request when school achievement seemed inconsistent with a previously obtained *IQ*. Since all children in the present study were examined by experienced and certified teachers, the reliability of test results is probably as high as might be expected had they been examined by qualified psychometrists.

E. RESULTS

1. *General Intelligence*

The principal question to be answered in this discussion is whether the Jewish and Scandinavian children are drawn from the same population

TABLE 5
DISTRIBUTION BY OCCUPATIONAL LEVEL OF STANFORD-BINET IQ's OF JEWISH AND SCANDINAVIAN CHILDREN ENROLLED IN MINNEAPOLIS PUBLIC SCHOOL KINDERGARTENS

Occupational level	N	Harmonic*	Mean IQ	SD	Variance**
<i>A. Jewish males</i>					
I	13	.0769	114.8	14.0	212.9
II	20	.0500	111.1	9.1	87.6
III	45	.0222	106.7	10.1	104.1
V	82	.0122	107.4	10.1	102.3
VI	14	.0714	104.2	10.5	118.3
VII	11	.0909	100.9	14.6	235.2
Total	185	.3236	107.5	10.6	122.7
<i>B. Scandinavian males</i>					
I	14	.0714	114.6	12.4	167.0
II	16	.0625	115.0	8.9	85.0
III	25	.0400	107.7	13.2	182.6
V	60	.0167	104.5	12.2	151.5
VI	7	.1429	101.8	10.8	138.1
VII	15	.0667	101.2	8.1	70.8
Total	137	.4002	106.8	12.2	158.2
<i>C. Jewish males and females</i>					
I	25	.0400	117.4	12.1	152.9
II	35	.0286	113.7	11.0	125.3
III	81	.0123	108.0	9.9	100.7
V	146	.0068	106.8	9.6	94.0
VI	25	.0400	104.8	10.2	108.6
VII	23	.0435	104.2	15.4	247.9
Total	335	.1712	108.3	10.8	125.0
<i>D. Scandinavian males and females</i>					
I	25	.0400	112.1	12.3	157.8
II	33	.0303	114.3	13.0	175.1
III	82	.0122	109.4	12.4	156.4
V	146	.0068	105.5	11.7	137.5
VI	25	.0400	98.0	14.6	223.9
VII	23	.0435	105.7	11.1	128.5
Total	334	.1728	107.3	15.1	166.5

*The Harmonic mean is included for the benefit of those who wish to check analysis of variance in Table 6. All total means, sigmas, and variances in this table have been computed, not added.

**The variances reported do not correspond to the squares of the standard deviation in the preceding column because the former are based on estimates from the degrees of freedom; the latter are not.

with respect to general intelligence within the six occupational levels (14). Inasmuch as an equal percentage of Jewish and Scandinavian subjects had been drawn from each of the occupational levels sampled, one should be justified in making the assertion that if the means and standard deviations of the two groups appear to be drawn from the same populations, then the two groups are drawn from the same population and hence do not differ.

In attempting to answer the above question it was found suitable to analyze the data by means of the analysis of variance technique (33). Analysis was made of the following groups: Jewish males, Scandinavian males, Jewish males and females, and Scandinavian males and females (Table 5).

A preliminary analysis was made to determine whether the variation among occupational levels is greater for each of the four groups than the variation

TABLE 6
ANALYSIS OF VARIANCE OF THE KINDERGARTEN BINET IQ'S OF CHILDREN WHOSE PARENTS
ARE DRAWN FROM SIX DIFFERENT OCCUPATIONAL LEVELS

	Degrees of freedom	Sum of squares	Mean square	F ratio	F (.05)	F (.01)
A. <i>Jewish males</i>						
Variation among occupations	5	1,606.7	321.3	2.74	2.26	3.12
Variation within occupations	179	20,986.9	117.2			
Total	184	22,593.6			.05 < p > .01	
B. <i>Scandinavian males</i>						
Variation among occupations	5	2,920.5	584.1	4.11	2.44	3.47
Variation within occupations	131	18,597.8	141.9			
Total	136	21,518.3			p < .01	
C. <i>Jewish males and females</i>						
Variation among occupations	5	4,099.6	819.9	7.16	2.24	3.08
Variation within occupations	329	37,682.5	114.5			
Total	334	41,782.2			p < .01	
D. <i>Scandinavian males and females</i>						
Variation among occupations	5	5,243.6	1,048.7	6.75	2.24	3.08
Variation within occupations	328	50,215.7	153.0			
Total	333	55,459.3			p < .01	

within individual occupational levels. A glance at Table 6 reveals this to be the case for all groups with the possible exception of the Jewish males. Here the obtained F ratio is significant only at the 5 per cent level. The results, however, show a consistent trend. An additional test was made to determine whether the variances within levels were true estimates of the total variance for each group; in other words, a test for homogeneity of variance (28, 36). The results in each case show that the variances within levels are homogeneous (Table 7). Hence the significance of the variance

TABLE 7
RESULTS OF WELCH-NAYER TEST FOR HOMOGENEITY OF VARIANCE BASED ON DATA FROM TABLE 6 (11)

	L_1	$L_{(.05)}$	$L_{(.01)}$	
Jewish males	1.9841	1.9571	1.9415	Homogeneous
Scandinavian males	1.9799	1.9410	1.9201	Homogeneous
Jewish males and females	1.9838	1.9746	1.9652	Homogeneous
Scandinavian males and females	1.9958	1.9746	1.9652	Homogeneous

ratios may be attributed to the differences among the means of the individual levels.

Having determined that the differences among the means are significant for the groups as a whole, one is justified in computing individual t -tests between levels to find out specifically where the differences occur. The results for each of the four groups are shown in Table 8. These results show a general tendency for extreme levels to be more highly differentiated than adjacent levels. This tendency is least clearly brought out in the Scandinavian Male and Female group.

Summarizing the results thus far, we find that the Jewish and Scandinavian groups sampled show a marked relationship between the level of occupation and the level of intelligence. Hence it is safe to move on to the principal question, namely whether the Jewish and Scandinavian groups sampled are similarly distributed with respect to intelligence within the six occupational levels.

Again the analysis of variance technique was used, this time to determine whether the variation between Jewish and Scandinavian groups at each occupational level was greater than the variation within groups at each level. Table 9 shows the results of comparing Jewish and Scandinavian males and Jewish and Scandinavian males and females. *The results are consistently negative; there is in no case a significant differentiation between the means of the groups at each level.* This information is made even more meaningful by the fact that the variances of the two groups are consistently homo-

TABLE 8
COMPARISON OF OCCUPATIONAL LEVELS WITHIN EACH GROUP BY MEANS OF THE *t*-TEST*

Groups compared	<i>t</i>	<i>p</i>	<i>t</i>	<i>p</i>
A. <i>Jewish males</i>			B. <i>Scandinavian males</i>	
I and VII	3.14	<.01	3.04	<.01
II and VII	2.51	<.05>.01	3.24	<.01
III and VII	1.61	>.05	1.69	>.05
V and VII	1.88	>.05	<i>t</i> <1	>.05
VI and VII	<i>t</i> <1	>.05	<i>t</i> <1	>.05
I and VI	2.53	<.05>.01	2.32	<.05>.01
II and VI	1.81	>.05	2.45	<.05>.01
III and VI	<i>t</i> <1	>.05	1.16	>.05
V and VI	<i>t</i> <1	>.05	<i>t</i> <1	>.05
I and V	2.30	<.05>.01	2.85	<.01
II and V	1.36	>.05	3.14	<.01
III and V	<i>t</i> <1	>.05	1.13	>.05
I and III	2.37	<.05>.01	1.73	>.05
II and III	1.49	>.05	1.41	>.05
I and II	<i>t</i> <1	>.05	<i>t</i> <1	>.05
C. <i>Jewish males and females</i>			D. <i>Scandinavian males and females</i>	
I and VII	4.28	<.01	1.77	>.05
II and VII	3.29	<.01	2.55	<.05>.01
III and VII	1.49	>.05	1.26	>.05
V and VII	<i>t</i> <1	>.05	<i>t</i> <1	>.05
VI and VII	<i>t</i> <1	>.05	2.15	<.05>.01
I and VI	4.18	<.01	4.01	<.01
II and VI	3.17	<.01	4.69	<.01
III and VI	1.31	>.05	4.02	<.01
V and VI	<i>t</i> <1	>.05	2.78	<.01
I and V	4.57	<.01	2.46	<.05>.01
II and V	3.38	<.01	3.71	<.01
III and V	<i>t</i> <1	>.05	2.30	<.05>.01
I and III	3.86	<.01	<i>t</i> <1	>.05
II and III	2.62	<.01	1.93	>.05
I and II	1.34	>.05	<i>t</i> <1	>.05

$$*t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{SE_1^2 + SE_2^2}} \text{ where } SE_1^2 = \frac{\text{within group variance}}{N_1} \text{ and } SE_2^2 = \frac{\text{within group variance}}{N_2} \quad (12).$$

geneous. Only in four cases does *p* approach the 1 per cent level (Table 10).

Apparently, then, the Jewish and Scandinavian children sampled at the six occupational levels are drawn from the same population with respect to general intelligence.

2. Vocabulary

Having rigorously established the equivalence of our groups, we are now in a position to compare performance on sub-tests of the Binet Scale and

consider other factors by means of the familiar "critical ratio" technique (ratio of the difference between means to the standard deviation of the difference). Vocabulary score was based upon the number of words correctly defined, and our findings (Table 11) show conclusively that neither group excels the other in this respect.

TABLE 9
ANALYSIS OF VARIANCE OF JEWISH AND SCANDINAVIAN KINDERGARTEN BINET IQ's
AT EACH OF SIX OCCUPATIONAL LEVELS

	Degrees of freedom	Sum of squares	Mean square	<i>F</i>	<i>F</i> _(.05)	<i>F</i> _(.01)
<i>A. Jewish and Scandinavian males</i>						
<i>Level I</i>						
Variance between Jewish and Scandinavian males	1	.2	.2	<1	4.24	7.77
Variance within Jewish and Scandinavian males	25	4,727.9	189.1		p>.05	
Total variance	26	4,728.1				
<i>Level II</i>						
Variance between Jews and Scandinavians	1	139.5	139.5	1.61	4.13	7.44
Variance within Jews and Scandinavians	34	2,944.7	86.6			
Total variance	35	3,084.3			p>.05	
<i>Level III</i>						
Variance between Jews and Scandinavians	1	15.5	15.5	<1	3.98	7.01
Variance within Jews and Scandinavians	68	8,966.3	131.8			
Total variance	69	8,981.8			p>.05	
<i>Level V</i>						
Variance between Jews and Scandinavians	1	284.3	284.3	2.31	3.92	6.81
Variance within Jews and Scandinavians	140	17,232.7	123.0			
Total variance	141	17,517.0			p>.05	
<i>Level VI</i>						
Variance between Jews and Scandinavians	1	27.5	27.5	<1	4.38	8.18
Variance within Jews and Scandinavians	19	2,367.7	124.6			
Total variance	20	2,395.2			p>.05	
<i>Level VII</i>						
Variance between Jews and Scandinavians	1	.5	.5	<1	4.26	7.82
Variance within Jews and Scandinavians	24	3,345.3	139.3			
Total variance	25	3,345.8			p>.05	

TABLE 9 (continued)

	Degrees of freedom	Sum of squares	Mean squares	<i>F</i>	<i>F</i> _(.05)	<i>F</i> _(.01)
<i>B. Jewish and Scandinavian males and females</i>						
<i>Level I</i>						
Variance between Jewish and Scandinavian males and females	1	359.1	359.1	2.31	4.04	7.19
Variance within Jewish and Scandinavian males and females	48	7,457.8	155.3		<i>p</i> > .05	
Total variance	49	7,817.0				
<i>Level II</i>						
Variance between Jews and Scandinavians	1	7.1	7.1	< 1	3.99	7.04
Variance within Jews and Scandinavians	66	9,866.7	149.4			
Total variance	67	9,873.9			<i>p</i> > .05	
<i>Level III</i>						
Variance between Jews and Scandinavians	1	81.4	81.4	< 1	3.91	6.81
Variance within Jews and Scandinavians	161	20,735.1	128.7			
Total variance	162	20,816.6			<i>p</i> > .05	
<i>Level V</i>						
Variance between Jews and Scandinavians	1	136.9	136.9	1.18	3.87	6.72
Variance within Jews and Scandinavians	290	33,572.8	115.7		<i>p</i> > .05	
Total variance	291	33,709.8			<i>p</i> > .05	
<i>Level VI</i>						
Variance between Jews and Scandinavians	1	571.2	571.2	3.43	4.04	7.19
Variance within Jews and Scandinavians	48	7,983.2	166.3			
Total variance	49	8,554.4			<i>p</i> > .05	
<i>Level VII</i>						
Variance between Jews and Scandinavians	1	26.6	26.6	< 1	4.06	7.24
Variance within Jews and Scandinavians	44	8,282.3	188.2			
Total variance	45	8,308.9			<i>p</i> > .05	

3. Basal Age

The subject of scattering on the Binet Scale has received much attention in the literature and its incidence, as indicated by the position of the basal year, would seem to have some significance in a study of this type. However, no differences in basal age were found to obtain between the two

TABLE 10
RESULTS OF TESTING THE DATA IN TABLE 9 FOR HOMOGENEITY OF VARIANCE (19)

Occupational level	F	F _(.05)	F _(.01)
<i>A. Males only: Scandinavian vs. Jewish</i>			
I	1.27	2.60	3.96
II	1.03	2.33	3.36
III	1.75	1.76	2.24
V	1.40	1.51	1.78
VI	1.17	2.29	4.62
VII	3.32*	2.66	3.94
<i>B. Males and females: Scandinavian vs. Jewish</i>			
I	1.03	1.98	2.66
II	1.40	1.80	2.30
III	1.55	1.45	1.70
V	1.46*	1.32	1.47
VI	2.06*	1.98	2.66
VII	1.93	2.05	2.97

*Although $p < .05$, it is still $> .01$, consequently the variation is considered homogeneous. This region of doubt would have been more rigorously dealt with if we had found the *means* to be significantly different. As it stands, the evidence favors our acceptance of the null hypotheses.

TABLE 11
SIGNIFICANCE OF THE DIFFERENCE BETWEEN MEAN VOCABULARY SCORES OF JEWISH AND SCANDINAVIAN CHILDREN WITH REFERENCE TO OCCUPATIONAL LEVEL

Occupational level	Jewish		Scandinavian		$M_1 - M_2$	$SD_{diff.}$	D
	Mean	SD	Mean	SD			$SD_{diff.}$
I	3.92	4.06	3.40	1.07	.52	.83	.62
II	4.05	3.41	3.39	2.90	.66	.75	.88
III	3.69	2.58	3.57	2.74	.40	.12	.30
V	3.10	2.52	2.99	2.78	.30	.11	.36
VI	2.32	2.03	2.60	2.49	.63	.28	.44
VII	3.47	2.01	3.08	2.26	.61	.39	.63
Total*	3.36	2.64	3.18	2.81	.18	.17	1.05

*Computed, not added.

TABLE 12
SIGNIFICANCE OF THE DIFFERENCE BETWEEN MEANS FOR BASAL AGE AMONG OCCUPATIONAL LEVELS OF THE SCANDINAVIAN GROUP

	Occupational level					
	I	II	III	V	VI	VII
I		.15	.27	.63	2.92*	.46
II			.50	.90	.98	.35
III				.56	1.70	.47
V					3.22*	.85
VI						2.96

*Differences favor level in vertical column.

TABLE 13
SIGNIFICANCE OF THE DIFFERENCE BETWEEN MEANS FOR BASAL AGE AMONG
OCCUPATIONAL LEVELS OF THE JEWISH GROUP

	I	II	Occupational level III	V	VI	VII
I		2.08*	2.09*	2.39*	1.72	1.57
II			.37	.18	.72	1.63
III				.25	.52	.37
V					.68	.56
VI						.89

*Differences favor level in vertical column.

groups. All *CR*'s were less than 0.40 for sex differences between the groups. Table 13 presents intra-group comparisons of basal age upon the basis of socio-economic levels for Jewish subjects. Table 12 offers similar data for Scandinavian subjects. These figures indicate a slightly higher basal age for Level I of the Jewish distribution. Among the Scandinavian classes Levels I, V, and VII were slightly superior to VI. The mean basal age (in months) for the Jewish group was 4.45, *SD* 0.98; for the Scandinavian group it was 4.53, *SD* 1.0. A critical ratio of 0.13 was found for a comparison of the means between the two groups.

4. Incidence of High and Low Scores

While no attempt is made within the confines of this study to answer the question concerning the frequency of high and low scores among members of the Jewish community, we are in a position to suggest a possible answer to the problem. Table 14 shows that the groups do not differ significantly at the upper levels of the distribution, i.e., there are not, in this study, a greater number of bright Jewish than Scandinavian children and vice-versa. However, surprising differences do occur at the lower end of the distribution. Among the females there are "probably significant" differences at the 55-69 and 80-89 *IQ* classifications. A comparison of the total groups reveals a difference of 3.7 per cent at the 80-89 level which favors the Jewish group ($p < .05 > .01$). While the critical ratio is not significant in terms of criteria generally adhered to in such cases, it approaches significance and is therefore somewhat more than merely suggestive. This may indicate that there are not more bright individuals who fall into the "dull normal" and "defective" categories. These data have interesting implications when we compare them with Table 3. If this finding should be corroborated by further research it may be surmised that the high value placed upon intelligence and education among Jews has resulted in a diminution in the number

TABLE 14
INCIDENCE OF JEWISH AND SCANDINAVIAN *IQ*'s AT VARIOUS POSITIONS ON THE DISTRIBUTIVE CURVE

IQ range	Males			Females			Total			
	Jewish N	%	Scandinavian N %	Jewish N	%	Scandinavian N %	Jewish N	%	Scandinavian N %	CR
140+ (Genius)				1	.7	1	1	.5	2	0.23
120-139 (Superior)	20	11.2	19 14.5	19	13.0	29 15.1	39	12.0	48	14.9 1.08
110-119 (Bright)	52	29.2	33 25.0	53	36.3	59 30.7	106	32.7	92	28.5 1.16
90-109 (Average)	98	55.0	69 52.6	69	47.3	88 45.8	166	51.2	157	48.6 0.66
80-89 (Dull-normal)	5	2.8	9 6.8	3	2.1	11 5.7	8	2.5	20	6.2 2.31
70-79 (Dull)	2	1.1	1 .7	1	.7	1 .5	3	.9	2	.6 0.44
55-69 (Defective)	1	.6	0 0	0	0	3 1.6	1	.3	3	.9 0.98

of dull and defective members of the group by high standards of selective mating within the group.

5. *Sub-Test Comparisons*

It has long been a popular conception that Scandinavians are slow, plodding, and patient whereas Jewish children are quick and alert. The inferiority of Jewish children on tests of motor performance has been alluded to in the literature (3, 17). If this is true, should we expect to find significant differences on sub-tests which presuppose the possession of certain traits by the individual tested? Despite our failure to discover differences in vocabulary score, should we find that Jewish subjects excel on verbal items? The hazard of fitting the data to preconceived stereotypes is fully realized by the writer, but in this case we believe that the data speak for themselves.

An analysis of the percentage of individuals in the total Jewish and Scandinavian populations who pass and fail certain tests reveals some interesting and challenging results.³ Jewish children surpass others on tests which involve *counting pennies, distinguishing right and left, comprehension, naming coins, giving the date, and repeating four digits backwards*. Scandinavian children excel others in *copying a diamond* and in the *ball and field test*.

Table 15 shows sub-test differences for each socio-economic level. In this table, as well as in Table 16, we have included all critical ratios between the 5 per cent and 1 per cent level of significance. In Table 16 we find that Scandinavian males excel Jewish males on tests which require motor coordination and patience and this is also true of Scandinavian females compared with Jewish females. Jewish females surpass Scandinavian females on tests which require temporal and spatial orientation, rote memory, and language comprehension. One might even suggest that Jewish females are somewhat more mature mentally than are Scandinavian females. Jewish boys surpass Scandinavian girls on verbal-experiential items while the latter excel on tests of motor coordination. Jewish girls surpass Scandinavian boys on similar tests with the exception of patience. Females of both groups are superior to males on tests of color naming and bow-knot tying, just as Terman has pointed out (34).

³In computing the significances of differences in these tables we used Yule's formula for the standard error of a proportion $\sigma p = \sqrt{\frac{pq}{N}}$. The computational work was greatly facilitated by means of Edgerton and Paterson's *Table of Standard Errors and Probable Errors of Percentages for Varying Numbers of Cases*. *J. App. Psychol.*, 1926, 10, 378-391.

TABLE 15

A COMPARISON OF SUBTEST DIFFERENCES BETWEEN JEWISH AND SCANDINAVIAN KINDERGARTEN CHILDREN ACCORDING TO OCCUPATIONAL LEVEL (1916 REVISION)

Occupational level	Jewish excel	Test No.	$D/\sigma_{diff.}$	Scandinavian excel	Test No.
I	Distinguishing right and left	VI-1	2.47		
	Giving differences from memory	VII-5	3.10		
	Definitions superior to use	VIII-5	2.92		
			3.10	Counting pennies	VI-3
II.	None			None	
III.			2.29	Giving number of fingers	VII-1
			2.29	Tying bow-knot	VII-4
			3.58	Copying diamond	VII-6
			2.59	Ball and Field	VIII-1
	Comprehension	VIII-3	2.00	Similarities	VIII-4
V.	Aesthetic comparison	V-3	2.77		
	Counting pennies	VI-4	3.48		
	Sentence repetition	VI-5	2.68		
			2.76	Copying diamond	VII-6
			2.22	Ball and Field	VIII-1
VI.			2.18	Comprehension	VIII-3
	Comprehension	IV-4	2.08		
	Naming coins	VI-5	2.44		
			2.08	Picture description	VII-2
VII.			2.50	Ball and Field	VIII-1
	Definitions	V-4	2.26		
			2.41	Patience	V-5
Total	Counting pennies	IV-3	2.00		
	Right and left	VI-1	2.00		
	Comprehension	VI-4	3.33		
	Naming coins	VI-5	3.33		
	Giving date	IX-1	3.00		
	Four digits backwards	IX-4	4.00		
			4.06	Copying diamond	VII-6
			3.00	Ball and Field	VIII-1

F. DISCUSSION

We have found, in this study, that Jewish and Scandinavian children do not differ in general intelligence as measured by the 1916 Revision of the Stanford-Binet Scale. Since we have postulated that differences, where they exist, are culturally determined, we must logically assume that "general intelligence" of individuals within a relatively homogeneous culture (Ameri;

TABLE 16
A COMPARISON OF SUBTEST DIFFERENCES BETWEEN JEWISH AND SCANDINAVIAN KINDERGARTEN CHILDREN ACCORDING TO SEX (1916 REVISION)

Jewish excel	Test No.	$D/\sigma_{diff.}$	Scandinavians excel	Test No.
<i>A. Males vs. Males</i>				
		2.22	Copying square	IV-5
		3.26	Patience	V-5
Comprehension	VI-4	2.19		
Naming coins	VI-5	3.41		
Five digits	VII-3	3.88	Copying diamond	VII-6
		2.60		
		2.94	Ball and Field	VIII-1
<i>B. Females vs. Females</i>				
		2.22	Copying diamond	VII-6
Counting pennies	IV-3	2.50		
Digit repetition	IV-6	2.60		
Right and left	VI-1	3.60		
Comprehension	VI-4	2.10		
Five digits	VII-3	2.64		
Giving date	IX-1	2.14		
<i>C. Jewish boys vs. Scandinavian girls</i>				
		2.33	Naming colors	V-2
		5.51	Tying bow-knot	VII-4
		3.25	Copying diamond	VII-6
		4.19	Ball and Field	VIII-3
		2.20	Comprehension III	VIII-3
Right and left	VI-1	2.65		
Comprehension	VI-4	2.22		
Number of fingers	VII-1	2.40		
Digit repetition	VII-3	2.94		
<i>D. Jewish girls vs. Scandinavian boys</i>				
		4.72	Patience	V-5
Aesthetic comparisons	V-3	2.16		
Right and left	VI-1	2.03		
Comprehension	VI-4	2.19		
Naming coins	VI-5	2.39		
Digit repetition	VII-3	3.50		
Tying bow-knot	VII-4	3.68		
<i>E. Jewish males vs. Females</i>				
Males excel			Females excel	
		2.66	Color naming	V-2
		2.60	Repeating digits	VII-3
		5.00	Tying bow-knot	VII-4
		2.00	Ball and Field	VIII-1
<i>F. Scandinavian males vs. Females</i>				
		4.15	Tying bow-knot	VII-3
Patience	V-5	3.52		
Counting backwards	VIII-2	2.06		

can) is biologically determined; hence, since we reject any assumption of biological differences among peoples (with the exception of such physical characteristics as color, for example) our results are to be expected.

Because we are not, however, dealing with a "culture-free" intelligence

test, differences between groups on sub-tests influenced by the social environment must also be anticipated. It is important in this connection to unearth aspects of the culture pattern which have influenced successes and failures on individual tests. In doing this, some dependence upon theory and speculation is unavoidable.

Terman's (34) remarks on the tests might throw considerable light upon the mental organization which is required to solve them. The six items on which Jewish children excel (Table 15) will be considered first.

Terman states that *counting four pennies* (34, p. 154) "... is not to any great extent a test of 'schooling' ... it does not presuppose any power of calculation or a mastery of the number concepts from one to four." Concerning the naming of four coins he remarks (34, p. 184) "... it is not greatly influenced by differences in social environment." To fail the test "... betokens a lack of spontaneity of interest in things which we have mentioned ... as a fundamental presupposition of intelligence." Nevertheless (and these statements were made long before the days of the Iowa controversy) critics who have regarded this test as of little value because of its probable dependence upon environmental influence may be right. It seems logical to suppose that children in homes where an early familiarity with quanta and the media of exchange bear a vital relationship to future security and competence might be exposed quite early in life to such experiences. It further seems logical to suppose that Jewish children, conditioned by a tradition which arose out of frequent traumatic uprootings, would early learn the value of portable security, namely money.

Success of Jewish children on tests of comprehension and spatial orientation may be closely associated with the acquisition of language distinctions in the home. This may also be related to success on the *number of fingers* and *aesthetic comparisons* tests. The intimate relationship between cultural drive and language in the Jewish home may be gathered from Köhler and Anderson's study (22) of 10 settlement house districts ($N = 76,000$) in which it is shown that 62 per cent of Jewish families have phones while the range for the rest is 16 to 35; 7 per cent attend the university (range 1 to 3); only 10 per cent take no papers in the home (range 6 to 23); 29 per cent have radios (range 0 to 15); 36 per cent read for recreation (range 2 to 22.) The presence of these cultural artifacts and practices in homes of comparable means, with a larger number of them being found in Jewish homes, throws considerable light upon the relationship between test performance and social milieu.

The Scandinavian subjects were found to be markedly superior to Jewish

children on tests of *patience*, *copying a square*, *copying a diamond*, and the *ball and field test*. These successes would seem to reflect more than just motor coördination and early experience with pencils and crayons. According to Terman (34, p. 156) the examiner who administers the square copying test is told to "observe whether the child makes each part with careful effort, looking at the model from time to time, or whether the strokes are made in a haphazard manner with only an occasional glance at the original." Referring to both the square and the diamond copying tests he states (34, p. 157): "In none of them does success seem to depend very much upon the amount of previous instruction in drawing" (p. 205), "... age and training, apart from intelligence, affect it only moderately." What is apparently required is "appreciation of spatial relationships and use of visual impressions in guiding a rather complex set of motor coördinations." Attention must be called to the liberal sprinkling of qualifying terms and the meagerness of definite experimental evidence in support of these contentions.

Concerning the *test of patience* he remarks (34, p. 171) "... success in it depends upon a certain willingness to persist in a line of action under the control of an idea." The *ball and field test* is regarded as "... a test of practical judgment" (34, p. 212). Such traits as patience and willingness to pause and survey the problem, as well as the application of auto-critical abilities, contribute to success in solving these problems.

In the absence of conclusive evidence we are not warranted in stating that Jewish children have constitutionally poorer motor coördination. We may point out that the early development of language proficiency is stressed in Jewish homes while manipulatory and constructional activities are given scant attention (see Table 15, Level I). Emphasis is placed upon rapidity of response, a trait which is associated with efficiency of language comprehension. When these response attitudes and practices are applied to tasks which require patience the resulting product is not likely to be satisfactory. The influence of cultural values may be further adduced when we consider the high standards of Scandinavian workmanship in the arts and crafts while for centuries Jews have been prohibited by a religious taboo from creating art forms.⁴

In the course of our observations of children from both groups in the testing situation we have made an interesting discovery with regard to the manifestation of auto-critical abilities. The Jewish child is more critical

⁴Specifically, "Thou shalt not make unto thee any graven image, or any likeness of anything that is in heaven, or that is in the earth beneath, or that is in the water under the earth." *Exodus*, 20:4.

of himself as a performer and less critical of his objective performance. He demands frequent assurances of his status as a performer, constantly comparing himself with others who have already been tested. His queries suggest a preoccupation with self which may demonstrate how early in life members of a minority group such as this may show signs of insecurity and need for status. At any rate, these findings seem to point to the probable existence of cultural stereotypes in certain social groups.

A final observation must be mentioned. We have noticed an increase in the number of statistically insignificant differences (*CR*, 1.00 to 1.50) from Level I to VII. This may suggest that difference-trends increase as we progress from higher to lower socio-economic levels, reflecting a closer adherence to cultural norms among the less "assimilated" members of both the Jewish and Scandinavian groups.

G. CONCLUSIONS

Three hundred and twenty-three (131 males, 192 females) second generation Scandinavian and 324 (178 males, 146 females) second generation Jewish kindergarten children in the Minneapolis Public Schools, were tested by certified kindergarten teacher-testers on the 1916 Revision of the Stanford-Binet Scale. Rigorous control of age, sex, and socio-economic status was exercised. Homogeneity and equivalence of both groups was determined by the analysis of variance technique, involving Jewish males, Scandinavian males, Jewish males and females, and Scandinavian males and females. The following conclusions may be drawn:

1. Comparisons of Jewish and Scandinavian kindergarten children yielded consistently negative results with regard to general intelligence. No differences in general mental level are present when socio-economic status is controlled and matched in terms of the occupational distribution found in the community from which the sample is taken.
2. Variation among occupational levels is greater for each of the four groups studied than the variation within individual occupational levels, the relationship between intelligence and occupation being quite marked.
3. Variances of all groups within levels are homogeneous.
4. There is a general tendency for extreme levels to be more highly differentiated than adjacent levels.
5. Neither group exceeds the other in general vocabulary score, basal age, or chronological age.
6. There is a tendency for fewer Jewish than Scandinavian children to score in the 80-89 *IQ* range. This suggests that there are fewer dull Jew-

ish children in the community than population expectations would suggest.

7. Jewish children surpass Scandinavian children on tests which require counting pennies, distinguishing right from left, comprehension, naming coins, giving the date, and repeating four digits backwards.

8. Scandinavian children surpass Jewish children in drawing a square, copying a diamond, solving a test of patience, and on the ball and field test.

9. Scandinavian males surpass Jewish males and Scandinavian females surpass Jewish females on tests of motor coördination and patience. Jewish females surpass Scandinavian females on tests of spatial and temporal orientation, rote memory, and language comprehension. Jewish males surpass Scandinavian females on verbal-experiential items, while Scandinavian females surpass Jewish males on tests of motor coördination. Jewish girls are superior to Scandinavian boys on similar tests with the exception of patience.

10. A decrease in the number of statistically unreliable but consistent differences between the two groups becomes apparent as one passes from lower to upper socio-economic levels. This suggests the probable operation of an "assimilative" or adaptive factor.

11. Differences revealed by this study are present at an early age and appear to be explainable in terms of such cultural influence as have been discussed in this paper.

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SPEED, POWER, AND LEVEL IN THE REVISED MINNESOTA PAPER FORM BOARD TEST*¹

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In many testing situations a definite amount of time is allowed for work on the test material. This is the so-called time limit technique. It is economical in terms of time consumed and has appeared satisfactory for achieving reliable and valid measurement. The time limit score obtained in standard time is termed the "power" score in our discussion. In certain testing situations the subject is allowed to try all the items. Ample or unlimited time is given. Such a score is here termed a "level" score. In still other situations the total time taken to finish the test is recorded. This is the so-called work limit method of measurement. The score obtained by this technique is here termed "speed" score.

The Revised Minnesota Paper Form Board (2) contains 64 multiple choice items arranged in order of difficulty. The test is ordinarily given with a time limit of 20 minutes and the score derived from the total number right. The nature of the items suggest that both speed of response and the level which a subject is capable of enters into the score obtained in the standard time limit.

The main purpose of this experiment is to make an analysis of speed and level in the power score or score in the standard time. In addition, the relation of intelligence to the speed, level, and power scores will be determined.

Two forms (Series *AA* and *BB*) of the Revised Minnesota Paper Form Board were given to 103 university sophomores. The testing was done individually. In addition to the directions accompanying the blanks, the following supplementary instructions were given: "*Work rapidly but try not to make mistakes. Both the accuracy of your work and the time you take will count on your score. Do your best to give an answer to each problem. It is important that you follow the directions exactly.*"

At the end of 15 and again at the end of 20 minutes the subjects were requested to mark below the last item finished. They were then directed to finish the test. When the last item was done, the time taken for the whole

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test was recorded. Since a large number finished the test before 20 minutes had elapsed, 15 minutes were employed as the standard time limit. Only a very few of the subjects completed the test before the 15 minutes had elapsed. The aim was to employ a time limit such that only a very few of the fastest subjects would just about finish. This means that practically all subjects would work the same amount of time (15 minutes for power score).

Other measures obtained from the subjects were: (a) Scores on Forms 5 and 7 of the Wells' *Revised Alpha Examination*. Time limits used were those listed in Tinker and Baker (5). Group testing was used. (b) Centile scores on all subjects for the Minnesota College Ability Test were obtained from the University Testing Bureau.

The means and standard deviations for the basic scores are listed in Table 1.

TABLE 1
MEANS AND STANDARD DEVIATIONS FOR BASIC SCORES
N = 103 University Sophomores

Measure	Mean	SD
Paper Form-Board <i>AA</i> , Speed in Minutes	28.65	9.11
Paper Form-Board <i>BB</i> , Speed in Minutes	25.60	7.90
Paper Form-Board <i>AA</i> , Power score	38.57	7.77
Paper Form-Board <i>BB</i> , Power score	44.57	6.61
Paper Form-Board <i>AA</i> , Level score	53.25	6.78
Paper Form-Board <i>BB</i> , Level score	56.57	4.98
Minnesota College Ability, centile score	67.48	24.48
Wells Revised Alpha, Form 5 score	139.49	19.14
Wells Revised Alpha, Form 7 score	152.64	18.62

It will be noted that there is a practice effect present in each test where two forms were used. Also the standard deviations tend to be relatively smaller on the second form of a test.

Zero order correlations between the various test scores are shown in Table 2. Reliability coefficients (one form versus an equivalent form) are: power score for Form Board, $r=.723$; level score for Form Board, $r=.693$; speed score for Form Board, $r=.815$; Alpha score, $r=.873$; Minnesota *C.A.T.* score, $r=.880$ (4). Thus, of the Form Board scores, the speed score is most reliable. Reliability for the power score is lower than for the unrevised Minnesota Form Board Test.

To what degree does level vary with speed in the Form Board scores? For Form *AA*, the correlation between speed and level is .070; for Form *BB*, .183. Comparable coefficients when speed is measured on one form and level on the other are .104 and .126. None of these coefficients is significant. It appears, therefore, that speed and level in this test vary independently.

TABLE 2
ZERO ORDER CORRELATIONS FOR PAPER FORM-BOARD AND INTELLIGENCE TEST SCORES
N = 103 University Sophomores

Variables	Form-Board <i>AA</i>			Form-Board <i>BB</i>			Intelligence	
	No. right 15 min.: Power	No. right total time: Level	Total time: Speed	No. right 15 min.: Power	No. right total time: Level	Total time: Speed	Minne- sota C.A.T.	Re- vised Alpha 5
No. right total time: Level <i>AA</i>	+.531							
Total time: Speed <i>AA</i>	-.690	+.070						
No. right 15 min.: Power <i>BB</i>	+.723	+.245	-.707					
No. right total time: Level <i>BB</i>	+.355	+.693	+.104	+.276				
Total time: Speed <i>BB</i>	-.528	+.126	+.815	-.814	+.183			
C.A.T.	+.197	+.130	-.129	+.181	+.033	+.163		
Alpha 5	+.268	+.130	-.172	+.248	+.056	-.174	+.562	
Alpha 7	+.291	+.185	-.203	+.267	+.096	-.223	+.568	+.373

There is a significant correlation between Form Board power and level scores. For Form *AA*, the coefficient is .531; for Form *B*, .276. Comparable coefficients when level is measured on one form and power on the other are .355 and .245. Likewise the correlation between power and speed is significant. For Form *AA* the coefficient is -.690; for Form *BB*, -.814. Comparable coefficients when speed is measured on one form and power on the other are -.528 and -.707. Thus the faster workers get the better scores when a time limit is employed.

It is important to know the relationship of speed and level in the power score of the Form Board Test. The first step in computing this is to obtain the coefficient of determination, explained by Guilford, p. 305 (1). To compute the coefficient of determination, the zero order coefficients are squared. The result indicates the per cent of variance in one variable which is determined by the other. In Form *AA*, the correlation between speed and power is -.690. This squared equals .476, indicating that 47.6 per cent of power is determined by speed. Similarly for level and power (.531 squared), the

contribution of level to power is .282 or 28.2 per cent. It has been shown above that speed and level vary independently. Hence the coefficients of determination may be added ($.476 + .282 = .758$). This shows that 75.8 per cent of the variance of power is accounted for by speed and level. There is left 24.2 per cent that comes from other undetermined factors. An alternate method, employing the coefficient of multiple correlation (1, p. 386) yields approximately the same result. Its use revealed that 71.1 per cent of power is accounted for by speed and level. When similar computations are made for Form *BB* of the Form Board, 73.8 per cent of power is accounted for by speed and level. In this instance, however, speed contributes relatively more (66.3 per cent) than level (7.5 per cent). Possibly this is due to familiarity with the test material since Form *BB* always followed Form *AA*.

This analysis of power, speed and level scores on the Paper Form Board Test have revealed: (a) The speed and level scores vary independently. (b) Speed and level account for a considerable amount (about 75 per cent) of the score obtained with a set time limit (power). (c) Speed is more important than level in the power score, especially after the subject has had practice with the material.

What is the relation between intelligence and the Paper Form Board scores? It is reported in Minnesota Mechanical Ability Tests (3) that intelligence correlates $.53 \pm .05$ with the original Paper Form Board scores. This unrevised test is somewhat different from the revision employed in this study. In the former the subject draws lines in the figures to obtain the indicated segments. But in the latter, five sets of drawings one of which is correct, are presented to the subject and he indicates the correct one. Presumably the difference between our results (presented below) and the earlier ones are largely due to the variation in the Paper Form Board test material.

The correlations between the intelligence tests and Form Board scores are given in the lower portion of Table 1. None of the coefficients between the College Ability Test and the Form Board scores is significant. For Alpha, however, there is a significant correlation of about .27 (mean) with Form Board power score. None of the coefficients for Form Board speed and level scores versus Alpha are significant. Application of partial and multiple correlation to these coefficients revealed no important changes. It appears, therefore, that Revised Paper Form Board scores are little affected by intelligence as measured by Alpha or the Minnesota College Ability Test.

A further problem that might well be investigated is the relation between speed, power, and level scores in the Paper Form Board Test and a criterion of mechanical ability such as quality of machine shop work.

SUMMARY AND CONCLUSIONS

1. An analysis of speed, power and level scores was made for the Revised Minnesota Paper Form Board Test.
2. Subjects in the experiment consisted of 103 university sophomores.
3. Speed and level scores were found to vary independently.
4. A major proportion (about 75 per cent) of the power score is accounted for by speed and level. Speed contributes relatively more to the power score than level.
5. There is only a slight correlation between intelligence and the Paper Form Board scores. This is in contrast with the correlation of .53 between the unrevised Paper Form Board Test and intelligence.

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ADOLESCENT MOTIVATION: SEX DIFFERENCES*

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A. THE PROBLEM

The purpose of this study, as originally projected, was to ascertain the nature and extent of physical disabilities among pupils enrolled in four Philadelphia high schools. The data, when collected, revealed several points of interest, chief among which was the sharp increase in "medicals" (pupils allegedly ailing or physically handicapped) during the adolescent period, an increase which was confined almost entirely to the girls. The present report is concerned chiefly with this increase and with the circumstances presumably responsible for it.

B. SOURCES OF DATA

The data were derived from the medical certificates presented by pupils who, for one reason or another, wished to be excused from participation in the classwork of the physical education department. This work consists of a variety of games and exercises designed to promote the health and physical fitness of the pupils. The four high schools—two junior and two senior—included in the survey have a total enrollment of approximately 8,200 pupils.

C. ANALYSIS OF DATA

As might be expected, the designations employed by the physicians in filling out the medical certificates were highly varied. Their unwieldy nature necessitated some classification such as that employed in Table 1. This table shows the distribution and relative incidence of "medicals" among White and Negro girls in one of the four schools.

Since 51.8 per cent of the girls enrolled in this school were Whites and 48.2 per cent were Negroes, it will be seen that the former are disproportionately represented—the Whites by 16.8 per cent of their total and the Negroes by 10.7 per cent of their total. Out of this number of girls (328) almost all—89.6 per cent were excused from "gym" classes for more than half the time. What this means is that about 14 per cent of the girls enrolled

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TABLE 1
SHOWING THE INCIDENCE OF "MEDICALS" AMONG WHITE AND NEGRO GIRLS IN A TOTAL
SCHOOL POPULATION OF 2,356

Nutritional	16	2	18
Cardiac	64	46	110
Nervous	5	2	7
Glandular	25	14	39
Respiratory	5	7	12
Post Operative	26	8	34
Muscular	3	2	5
Structural	9	9	18
Traumatic	12	6	18
Miscellaneous	42	25	67
Totals	207	121	328

each semester received little or no benefit from the physical fitness program provided by the school.

But it is in Table 2 that the really striking feature of the study is revealed.

TABLE 2
SEX DIFFERENCES IN THE INCIDENCE OF "MEDICALS" AMONG PUPILS ENROLLED IN JUNIOR
AND SENIOR HIGH SCHOOLS

Grade	Boys per cent	Girls per cent
<i>Jr. H. S.</i>		
Seventh	6.7	6.8
Eighth	7.1	8.2
Ninth	6.3	10.2
<i>Sr. H. S.</i>		
Tenth	6.5	9.3
Eleventh	7.3	16.7
Twelfth	7.6	24.3

It is evident from this table that while the incidence in "medicals" tends to remain constant, so far as the boys are concerned, it increases markedly in the case of the girls during and following the adolescent period.

Turning to Table 3, differences between the boys and girls also appear in the type of disability for which the pupil is excused. These differences—most noticeable under the headings, cardiac, nervous, glandular, muscular, traumatic and miscellaneous—are not unrelated to the changes which occur with age, since it is within three of these groupings—the cardiac, glandular and miscellaneous—that the increase in "medicals" among the girls during adolescence is most in evidence. In one girls' high school the cardiac, glandular and miscellaneous categories showed increases, respectively, of 87 per cent, 115 per cent and 65 per cent over a four year period.

TABLE 3
CLASSIFICATION AND DISTRIBUTION OF "MEDICALS" AMONG SENIOR HIGH SCHOOL PUPILS

Pathology	Boys per cent	Girls per cent
Nutritional	6.01	5.48
Cardiac	30.62	33.59
Nervous	4.28	2.13
Glandular	6.73	11.89
Respiratory	4.91	3.65
Post Operative	12.36	10.36
Muscular	6.66	1.52
Structural	6.44	5.48
Traumatic	8.72	5.48
Miscellaneous	13.22	20.42

D. INTERPRETATION

In seeking an account of the increase in "medicals" among the girls—an increase amounting to almost 400 per cent when the entire adolescent and post-adolescent period is considered—three interpretations are possible: *first*, the increase may be regarded as genuine, that is, as representing a true increase in actual physical incapacity to participate in the activities of the gymnasium; *second*, it may be attributed to increased consciousness of existing disabilities, or to increased ability to detect such disabilities; or, *third*, we may regard the problem as one of motivation in which the changes incident upon adolescence give rise to new interests centering about conditions which make it highly desirable to secure the medical certificates which alone will excuse the pupil from "gym" work.

No competent authority has been found who is willing to support the first of these interpretations, or who believes that girls are any more subject to disease during their teens than at any other time. That increasing awareness of existing debilities could account for the magnitude of the change is no less open to question, since such awareness should be equally in evidence among the boys.

That the third alternative is correct and that we are confronted with a problem in adolescent motivation is supported by the following considerations:

1. The increase is confined to the girls, there being no appreciable change among the boys.
2. The increase occurs during and following adolescence, a period of transition in which the interests of the girls are given strong social direction with subsequent loss of interest in activities of a purely physical nature.
3. The reports of the teachers in charge of the girls' "gym" classes are strikingly in accord on certain points: that most of the girls seeking to be

excused are not physically handicapped at all, and that the underlying and real considerations are to be found in (*a*) physical disinclination, (*b*) concern lest "hair-do" and "make-up" be disturbed, (*c*) fear of developing big muscles, and (*d*) unwillingness to make the changes in dress required before appearing on the gymnasium floor.

That physical conditions combine with social motives to produce the change can scarcely be doubted. Well known differences in metabolism and in glandular balance are perhaps of chief importance. Thus, the superior muscular development of the male is correlated with higher protein and general metabolism (17 per cent higher in the male than the female at the age of 17) and with somewhat higher adrenal output. In turn, the relatively lower metabolic rate of the female is coupled with larger fatty deposits and with important changes in body proportions. Variations such as these tend to reduce physical activity in teen-age girls and create a dislike for all exercises, unless, indeed, they serve some social purpose, as is true of dancing. In passing, it may be noted that a good illustration of this is found in the failure to interest women in the physical fitness campaign conducted in Philadelphia and other large centers. The classes for women (as compared with those for men) are poorly attended, and those who do attend are interested chiefly in reducing—that is, in physical fitness only as it relates to physical appearance.

It is scarcely to be argued that disinclination is an adequate excuse for avoiding physical exercise. If that were so, then the ones most in need of exercise might receive none at all. That girls showing such disinclination should be able to secure the medical certificates excusing them from "gym" classes would seem to reflect unfavorably upon the medical profession. That family physicians yield to the desires of the pupil and parents in this regard is strongly suggested by the following:

First, the 400 per cent increase in "medicals" occurs during a period which is not noted for failure of health.

Second, the incidence of "medicals" is much higher among White (50 per cent in one school) than among Negro children and among those better able to pay for the services of the physician.

Third, the maladies showing the sharpest increase during the period under consideration are of a type calling for expert diagnosis and not apparent to the ordinary observer—such as, heart murmur, endocrine imbalance, chronic appendicitis, and pelvic congestion.

E. SUMMARY

Data collected in two junior and two senior high schools, having a total

population of 8,200, showed that the incidence of pupils asking to be excused from gymnasium classes on the basis of alleged physical disabilities increased markedly during the adolescent period, an increase which was confined almost entirely to the girls. The increase in the cast of the latter—400 per cent between the 7th and the 12th grade—is attributed, not to any change in susceptibility to disease, but to changes in interests and motives. These interests and motives, which are given strong social direction in the girls, are often out of accord with the demands of the gymnasium floor. The resultant disinclination is reinforced by vast internal changes, by an increase in fatty deposits, and by important shifts in body metabolism and body proportions.

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THE EARLY DEVELOPMENT OF SOCIAL ATTITUDES TOWARD EXCEPTIONAL CHILDREN*

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This study attempts to determine whether there exist any developmental parallelisms between certain phylogenetic and ontogenetic social patterns.¹ Animal investigations agree fairly well in the following respects: (a) definite hierarchical organization with levels of diminishing dominance, usually determined on a purely physical basis; (b) rejection and outlawing of weak, malformed, or otherwise anomalous members of the group; (c) tendency toward rigid group barriers, i.e., resistance to the entrance of new members in an established unit; (d) competition as a stronger and more primitive social pattern than cooperation; (e) little or no behavior analogous to human altruism, except at brief mating and maternal periods (1, 2, 4, 6, 8, 9, 10, 11, 12, 13).

The part of our ontogenetic experiment reported here concerns primarily the reciprocal reactions of normal and clinically exceptional children in various kinds of social situations. The method was essentially to place at successive but overlapping time intervals, specific types of handicapped children into an established normal group of equivalent age range. Experimental situations were of three kinds: spontaneous activity on the playground and in the nursery school; six simplified modifications of Gottschaldt's (3) tower-building experiment; and the first six of his "*Umweg*" problem-solving tasks. Each experimental situation was further divided into a control group of individually competitive tasks and a group of non-competitive cooperative tasks. The normal group (Group I) consisted of six children, aged 3 to 5:7 years, with mental ages ranging from superior to low average (*IQ* 118-102). Group II included six children of the same age range with retarded or borderline intelligence (*IQ* 100-85). All six subjects in Group II had serious speech defects. For three subjects, we have complete daily protocols over an experimental period of four months. Because of illness and change in residence, records of

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¹Acknowledgment is given to Miss Grace Powers of Ann Arbor, Michigan, who kindly offered the resources of her boarding home and day nursery school for this and other related experiments. The Speech Clinic of the Institute of Human Adjustment was also most cooperative throughout this and related experiments.

the others are incomplete. As far as they go, however, these records are closely similar to the former with regard to social adaptation. The data reported here are from the three completed records.

Subject A, girl; age 5:7 years, mental age 3:5 years; physically large; poor gross and fine coördination; emotionally affable; fairly submissive; persistently gregarious. (By this last term is meant consistent avoidance of solitude and consistent seeking of other children.) Clinical diagnosis, border-line Cretin with other endocrine complications and speech deficiency.

Subject B, girl; age 4:11 years; mental age 3:8 years; physically small; good gross, poor fine coördination; emotionally very unstable; destructively aggressive; persistently gregarious. Clinical diagnosis and special investigation, congenital hyperthyroidism, congenital speech deficiency.

Subject C, age 3:11 years, mental age 3 years; physically average; fair motor coördination; emotionally affable; moderately submissive; persistently gregarious. Clinical diagnosis, congenital retardation and speech defect.

All three children were totally lacking in vocabulary, substituting for it various types of primitive inflection and inarticulate sounds. These quite obviously served the purpose of desired communication as well as simple expression of mood or activity "overflow."

In the first part of the experiment, only one exceptional child was placed in the group at any given time. In the controlled coöperative situations, all three were present. When each one was first placed in the established normal group, a certain sequence of responses occurred, as follows: mutual interest; mutual spontaneous approach; marked surprise, with some disorganization and inhibition patterns, among the normal children when they encountered the abnormal speech; curiosity, diminishing swiftly, however, between the first introduction of *Subject A* and the later introduction of *Subject C*; brief persistence at efforts to converse with the exceptional child, and finally, swift relapse into their normal routine activities. The average time consumed by these "social approach" activities of the normal group was 8 to 12 minutes. The socially oriented behavior of the abnormal group, while very uneven, persisted much longer (15-20 minutes).

Since the normal group, through training, accepted mutual sharing of activities and play apparatus, there was at first no active rejection of the active social advances of the exceptional child. Neither was there overt encouragement. Within three days, however, conspicuous social patterns developed which remained basically permanent throughout the experimental period of four months, and the "therapeutic" or control period beyond. (By therapy is meant directed teaching of altruistic behavior toward the handicapped child.)

Protocols of the spontaneous behavior of Group I show that in the nursery at large, Subject *A* was "tolerated" in general, and somewhat protected in certain playground situations where her motor clumsiness resulted in falling, stumbling, etc. Subject *B*, however, was quickly rejected and violently and permanently excluded. Subject *C* was at first tolerated in the same manner as *A*, then similarly protected, and finally, on such occasions as playing house, where a live baby was preferable to a doll, she was deliberately if not forcibly incorporated into the group activity. This normal group, while closely integrated, had very early evolved its own stable hierarchy, in which *J*, a lively, amiable boy of high intelligence, and swift, efficient motor ability was leader. In the normal group, he ranked second in *IQ*, third in chronological age, and fourth in size. The child with the highest *IQ*, also the eldest of Group I, was rather shy and quiet, so it is clear that *J*'s more active temperament combined with his high intelligence to produce the leader rôle. There was furthermore, a small, but stable division in Group I in terms of chronological age, the two youngest children tending to play together with the simpler materials. This division seemed entirely spontaneous, however, not imposed by the older children, since there was no evidence of active exclusion on the part of the latter group.

It is interesting that after the fifth day, all three exceptional children were clearly on a lower hierarchical level than had hitherto existed. *A* and *C* docilely accepted this placement. *B* continued her aggressive efforts to enter into or to disrupt the group activities on all occasions, even though her destructive tendencies (throwing and banging objects, hitting and slapping, and restless running about) now met with equally pugnacious resistance, so that the group situation had always to be "resolved" artificially by the experimenters, without running its entire social course. Nor did the relative distances on the social periphery change very much even after the post-experimental "therapy" began. Through this systematic teaching, the normal children acquired new *verbal* reactions, but their overt social behavior remained about the same.

It seems clear that the primary segregating factor in the social exclusion of each of these three subjects, within this general or free situation, was that of individual temperament. Specific handicap seemed to play a secondary rôle.

In the controlled situations, both competitive and coöperative, temperament retained its dynamic influence, but the specific handicaps (in speech and intelligence) became increasingly important as segregating factors of a higher order. Thus, in individual competition in tower-building and "*Umweg*" problem-solving, there were few overt attacks and very little actual unkindness,

teasing, contempt, or even amusement at the inefficient behavior of the exceptional children. There were, however, constant and emphatic reports to the experimenters, to the effect that *A*, *B*, and *C* "couldn't do things," the children being obviously perplexed by the experimenters' insistence on their inclusion in the games. In the individual competitive series, there were a few definite offers to help *A*, and one or two normal children, contrary to the "rules of the game," overtly tried to help *C* solve the problem. There were none whatever to help the socially outlawed *B*. In fact, to replace the now forbidden counter-attacks on her aggressive patterns, the group developed a new reaction of quick dispersion whenever she appeared at the experimental period. Rejection-plus-*attack* became, in the controlled experiments with individual competition as a motive, rejection-plus-*avoidance*.

In the third set of experiments, the same tower-building and *Umweg* problems were transformed into coöperative games where each child was to help in the solution. Here the normal group "closure" became very marked, and the social "distance" of the exceptional children was greatly increased. All three abnormal subjects were now definitely and forcibly excluded from the group activity. Such altruistic behavior as did occur resembled shrewdness rather than kindness, and was clearly secondary to the goal of egocentric achievement. It did, however, take a very significant and intelligent form, in that it consisted mainly of pointing out *substitute* activities for *A* and *C*. Typical examples were leading them to a pile of very large cork blocks (away from the small blocks of the tower problem); showing them the crayons; taking them out to the sand pile, etc. Whenever *A* and *C* did not respond affably to such veiled exclusion, the veil was removed, and they were simply pushed out of the way. In these coöperative situations, the mere appearance of *B* led instantly to incipient group violence, only inhibited by the presence of the experimenter. Since *B*'s patterns of participation were all destructive, the entire experiment simply disintegrated under her continued presence, the normal children became indifferent or sullen, and their highly articulated coöperation swiftly disintegrated into random, disorganized activities.

Efforts to form a stable, social sub-group among these three exceptional children, comparable to the two youngest subjects of Group I were not successful. *A* cried and ran away, when paired with *B*. If pursued by the swifter child, *A* struck back or kicked, but always defensively. Subject *C*, though much smaller and younger, than *A*, struck out at once, if paired with the aggressive *B*, then ran away, and only occasionally cried. Both *A* and *C* preferred the normal children to each other, despite their common places on the outer fringe of the normal activities. These were crudely but happily

imitated by the more active *C*, while the more passive *A* soon grew content to stand at a distance and look on. She often stood still for long periods watching the others perform on the playground apparatus, and cried if taken away. It is clear that chronological age differences (such as size, etc.) as well as temperament differences, here outweigh the segregating power of similar mental age and similar speech handicap in the spontaneous social reaction of the exceptional children.

Experimental results for the others in Group II are very similar depending on whether their total behavior is characteristically aggressive or passive. It is, of course, necessary to repeat the experiment with speech-handicapped children of normal intelligence, and with defective children without such extreme speech defects as Group II shows.

Our cumulative data nevertheless indicate significant results in a field not hitherto explored in any systematic fashion. They show that, at these early age levels, social attitudes depend on how the particular child is perceived as a functional part of a given activity pattern. Contrary to general belief, they are much less egocentric and primitively emotional in origin than they are simply *pragmatic*. They are also highly dynamic in accordance with the changing situations. At this formative age, passive assimilation of handicapped children into an established social group is fairly easy and rapid in "free" activity situations where social integration is not taxed by specific mutual responsibilities. Such situations have, in other words, little social articulation in a functional sense, hence are more or less "fluid" in social boundary. In a complex coöperative task, on the other hand, where poor performance threatens the entire group goal, passive assimilation changes completely over into active and sustained exclusion, rigid barriers, and increased social distance. The less resistance offered to whatever peripheral hierarchy is imposed by the normal group, the faster and more permanently is the exceptional child admitted. Aggressive efforts to enter into the normal group meet with physical opposition, or if that be inhibited through control from above, by a generalized avoidance response and regression of group activities to random disorganization which strongly suggests a group-frustration pattern of behavior.

Something at least akin to human altruism occurs when normal children ameliorate social exclusion from a given activity by seeking to point out substitute activities to the exceptional child. Likewise, the sporadic protective attitudes toward younger and clumsier children on the playground, imply some primitive perception of unselfish social behavior. It is not possible to say how much of the attitudes here described result from home environment. We can only say that in spite of rather extreme diversity in the cultural and

economic backgrounds of this experimental group, the pattern of social response is astonishingly similar, in these situations, at these age levels. From a phylogenetic perspective, there are certain very striking similarities between the social behavior of animals and human children as to: hierarchy; dominance; group closure or barrier; and exclusion of anomalous (exceptional) individuals. There are also very important differences, in that purely biological factors (size, strength, age, sex, etc.) which predominate in animal hierarchies, are already secondary to or at least greatly modified by functional behavior of an *acquired* level. Except in highly integrated group patterns, the social barriers are much less rigid, i.e., more adaptive than in animals. Finally, the germ of human altruism, which is the basis of adult "social service," appears among young children to a much greater extent than any animal investigation has shown.

In conclusion, it is suggested that before discarding the principle of institutional segregation of mentally deficient or speech deficient children, as is often proposed by extreme believers in "environmental" cures, the serious problems of their social adaptation be further investigated.

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HOW WELL DO CHILDREN IDENTIFY THE SPONSORS FOR THEIR FAVORITE RADIO PROGRAMS?*

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The problem which this paper considers is two-fold. It is concerned first with a measurement of the popularity of various radio programs that are designed more especially for children, and second with the determination of how effectively the sponsors for the various programs get themselves identified.

The radio survey was made in the winter of 1939-1940 at the request of the Junior Advertising Club,¹ in the following manner. Forty-two radio programs were listed under the heading: "*In the following list of radio programs put a circle around the names of the programs which you listen to most of the time. Put a line under the names of the programs you listen to once in a while.*" In a parallel column on the right half of the page was a numbered list of names of 30 commercial sponsors or their product, and also the number 0 before the title "no sponsor." This list was headed by the directions: "*Here is a list of the sponsors of the different programs in the left hand column. Write the number of each sponsor in front of the name of the program it sponsors. The same company may sponsor more than one program. There are some programs which have no sponsor; zero (0) will be the number for programs with no sponsor.*"

Participants were requested to indicate their school, grade, age, sex, and to list any other programs they regularly listened to.

The questionnaires were taken to a number of schools where there was some assurance that the teachers would be coöperative. Two grammar school grades, one high school class, and a sampling of the college population were employed. The youngest group was 4th graders, whose average age we estimated at about 10. Their facility at reading and writing, and general level of comprehension we estimated to be approximately the minimum required to understand and answer the questionnaire properly. The next level to be employed was 7th graders, estimated at about the 13-year

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¹I am indebted to Beale McCulloch, president of the Club, who initiated the problem and collected much of the data.

level. High school sophomores came next, estimated at age 16. About 200 college students filled out the blanks, and these were divided by age, the younger half averaging 19, and the older, ranging up to 30, but averaging about 22 years of age. From 75 to 123 persons at each age level participated, fairly evenly divided into boys and girls for a total of 504 individuals.

1. A rough indication of the extent to which our youth listen to radio programs is indicated by the figures in Table 1. Here is found the average

TABLE 1
LISTENING HABITS OF BOYS AND GIRLS OF DIFFERENT AGE LEVELS TO RADIO PROGRAMS

Aver. age	10		13		16		19		22		Total	
Sex	M	F	M	F	M	F	M	F	M	F	M	F
Persons	33	65	45	42	87	35	40	83	42	32	247	257
Av. no. week of programs listened to:												
Usually	6.9	9.7	12.3	13.7	9.4	10.3	7.3	6.5	4.4	5.5	8.3	9.1
Usually or occasionally	13.3	16.5	23.8	22.4	19.6	22.8	15.4	14.8	12.9	13.1	17.0	17.9
Wrong iden- tification	5.7	6.8	7.6	7.8	6.9	8.6	4.8	5.0	5.2	5.0	6.2	6.5

number of these programs listened to usually, and also the average number listened to either usually or occasionally, by boys and girls at each age level, and the average errors in identification of the sponsor.

The first thing to note is the great number of programs that are listened to. Of course our survey lists only 42 programs. Yet this audience on the average listen to 8 or 9 programs a week regularly, and occasionally to as many as 17 or 18 of them. The peak for these programs comes with the children of the 7th grade, who consistently listen to more than a dozen programs, and listen occasionally to almost two dozen. The popularity of these programs drops off both for younger and for older persons.

Girls usually listen consistently to more programs than the boys at every age level, but that for young collegians. The most significant difference, however, is with the youngest group, where the girls listen regularly to almost 40 per cent more programs than do the boys.

The members of the group failed to identify or identified incorrectly, a little more than a third of the sponsors of the programs that they usually or occasionally listened to. The proportion is about the same for both boys and girls, and more or less regardless of age.

2. The popularity of the various programs, the time of their occurrence and the proportion of listeners who identify the sponsors is presented in

Table 2. The most popular program is sometimes listened to by over 80 per cent of the entire group, while the least popular program is occasionally listened to by less than 3 per cent of the group. About 18 of the 42 programs are quite familiar to half of this audience. Only 11 of the 42 programs interest less than 25 per cent of the audience. Out of 504 listeners an average of 210 hear occasionally each of these 42 programs.

Sunday is the day with the most popular programs, and 65 per cent of the audience on the average may listen to each of the Sunday programs. The three most popular programs appear on Sunday. Saturday is the worst day. We have but three programs selected from this day: two are for the morning and one for early afternoon, an amateur hour. The Saturday morning programs have hardly an audience at all. Of the week days, Friday and Monday are the poorest.

Fourteen of our programs are serials, appearing two to five times a week. The three of these which are most popular, ranking 15, 16, and 17, are the "*Lone Ranger*," "*Orphan Annie*," and "*Amos 'n' Andy*." They are listened to by over half of the audience. Six of the 10 least popular programs are also serials. The serials are of course distinctly juvenile programs, scheduled for hours the children ought to be around home. Some of them compete with each other at the same radio time. The one morning serial is attended by about 20 per cent of our audience. The eight afternoon programs scheduled before 6 P.M. are attended on the average by about 27 per cent, while the five evening serials are attended on the average by about 41 per cent of our audience.

Some interesting sex-differences appear with regard to a number of the less popular programs. Consider just the programs where the ratio of listeners of one sex is at least $3/2$ or greater than the other. The boys prefer *Sherlock Holmes*, *Tom Mix*, *Frank Watanabe* and *Archie*, and the *Model Club* (to which program only one girl confessed listening). The girls have a marked preference for *Burns and Allen*, *Blondie*, *Captain Dobb-sie*, *Uncle Frank's Children's Matinee*, *Jerry of the Circus*, *Father Goose Goes to Town*, and *Youth Makes a Record*. *Tom Mix* and *Jerry of the Circus* occur at the same time; so do *Frank Watanabe* and *Father Goose*.

3. Now let us consider the age-range of listeners to the various programs. The average age for our different educational level groups approximated 10 years for the 4th graders, 13 for the 7th graders, 16 for the 10th graders, 19 for the young college, and 22 for the older college students; and these numbers have been used in the calculations. In determining the average age-level of each program, it was necessary to consider that the number of

TABLE 2
SURVEY ON RADIO PROGRAMS

Popularity Rank	Program and sponsor	Day	Time	Length	No. out of 504 who listen	Per cent identifying program
1	Jack Benny (Jello)	Sun.	8:30	30	412	87
2	Edgar Bergen and Charlie McCarthy (Chase & Sanborn Coffee)	Sun.	5:00	60	380	79
3	One Man's Family (Tenderleaf Tea)	Sun.	9:30	30	351	88
4	Major Bowes' Amateur Hour (Chrysler Corp.)	Thurs	6:00	60	349	88
5	Fibber McGee and Molly (Johnsons' Wax)	Tues.	6:30	30	345	85
6	Kay Kyser (Lucky Strike)	Wed.	7:00	60	333	72
7	Kraft Music Hall (Kraft Cheese)	Thurs.	7:00	60	311	83
8	Fred Allen (Ipana Toothpaste and Sal Hepatica)	Wed.	9:00	60	299	73
9	Aldrich Family (Jello Pudding)	Tues.	8:30	30	292	34
10	Walter Winchell (Jergen's Lotion)	Sun.	9:00	15	280	83
11	Bob Hope (Pepsodent)	Tues.	7:00	30	273	56
12	Kate Smith (Grapenuts)	Fri.	9:00	60	265	28
13	Hobby Lobby (Fels-Naptha)	Sun.	8:00	30	262	28
14	Orson Welles (Campbell Soup)	Sun.	7:00	60	259	41
15	Lone Ranger (Buchan's Bread)	Mon., W., F.	7:30	30	256	73
16	Orphan Annie (Ovaltine)	Mon.-Fri.	5:45	15	256	93
17	Amos and Andy (Campbell Soup)	Mon.-Fri.	8:00	15	254	63
18	Professor Quiz (Teal Liquid Toothpaste)	Fri.	6:00	30	252	20
19	Good News of 1940 (Maxwell House Coffee)	Thurs.	6:00	60	248	49
20	Big Town (Rinso)	Tues.	8:30	30	246	65
21	Jack Armstrong (Wheaties)	Mon.-Fri.	5:30	15	240	89
22	Green Hornet (no sponsor)	Th. Sat.	9:00	30	218	82
23	Burns and Allen (Hind's Honey and Almond Cream)	Wed.	7:30	30	215	6
24	Sherlock Holmes (Bromo Quinine)	Tues.	5:30	30	208	68
25	Blondie (Camel Cigarettes)	Mon.	7:30	30	205	41
26	Lum and Abner (Postum)	M., W., F.	8:15	15	198	59
27	Uncle Walter's Doghouse (Sir Walter Raleigh's Tobacco)	Tues.	7:30	30	189	62
28	Adventures of Tom Mix (Ralston, Purina)	Mon., Fri.	5:15	15	164	82
29	Easy Aces (Anacin)	T., W., Th.	4:00	15	149	65

TABLE 2 (continued)

Popularity Rank	Program and sponsor	Day	Time	Length	No. out of 504 who listen	Per cent identifying program
30	Information Please (Canada Dry)	Tues.	8:00	30	148	46
31	Ask It Basket (Colgate Dental Cream)	Thurs.	8:30	30	146	19
32	Knowledge Kollege (Fahey Brockman)	Tues.	7:00	30	124	15
33	General Shafter Parker (no sponsor)	Mon., Fri.	6:15	15	119	85
34	Captain Dobbsie (Centennial Flour)	Mon., Fri.	8:00 A.M.	30	104	56
35	Frank Watanabe and Archie (no sponsor)	Mon., Fri.	5:00	15	94	52
36	Uncle Frank's Children's Matinee (no sponsor)	Sat.	3:00	60	86	58
37	Jerry of the Circus (Frederick and Nelson)	Mon., Fri.	5:15	15	77	72
38	Put and Take (Fahey Brockman)	Fri.	8:00	30	76	45
39	Father Goose Goes to Town (no sponsor)	Mon., Fri.	5:00	15	70	76
40	Talking Drums (no sponsor)	Mon., Fri.	4:45	15	38	84
41	Youth Makes a Record (Rhodes 10c Store)	Sat.	10:00 A.M.	30	23	56
42	Model Airplane Club (no sponsor)	Sat.	8:00 A.M.	15	13	72

persons at each age level was the same. Hence, in computing these averages, the percentage of persons listening at each age level was employed, rather than the actual number of persons listening (Table 3).

TABLE 3

Popularity Rank	Boys	Popularity Rank	Girls
<i>Most juvenile programs: half the audience under 13 years, 4 months</i>			
37	Jerry of the Circus	42	Model Airplane Club
39	Father Goes Goes to Town	39	Father Goose Goes to Town
40	Talking Drums	33	General Shafter Parker
42	Model Airplane Club	37	Jerry and the Circus
28	Adventures of Tom Mix	40	Talking Drums
38	Put and Take	35	Put and Take
15	Lone Ranger	28	Adventures of Tom Mix
21	Jack Armstrong	21	Jack Armstrong
33	General Shafter Parker	15	Lone Ranger
16	Orphan Annie		
<i>Most adult programs: half the audience over 17 years old</i>			
10	Walter Winchell	30	Information, Please
6	Kay Kyser	10	Walter Winchell
30	Information, Please	8	Fred Allen
7	Kraft Music Hall	14	Orson Welles
8	Fred Allen	7	Kraft Music Hall
14	Orson Welles	6	Kay Kyser
11	Bob Hope	32	Knowledge Kollege
19	Good News of 1940	19	Good News of 1940
<i>Program of most universal appeal: middle half of the audience with 6½ years or more age range</i>			
5	Fibber McGee	2	Edgar Bergen
32	Knowledge Kollege	19	Good News of 1940
41	Youth Makes a Record	3	One Man's Family
27	Uncle Walter's Doghouse	7	Kraft Music Hall
3	One Man's Family	34	Captain Dobbsie
1	Jack Benny	12	Kate Smith
18	Professor Quiz	10	Walter Winchell
14	Orson Welles	1	Jack Benny
12	Kate Smith	11	Bob Hope
19	Good News of 1940		

4. A major objective of this study was the determination of the accuracy with which the radio audience identified the sponsor for the program. Thirty of the programs were correctly identified by half or more of their audience. Nineteen of these sponsors are correctly identified by 70 per cent of their audience. All sponsors for serial programs are identified by more than half of their audience, the *Orphan Annie* program leading all programs with 93 per cent correct, and Jack Armstrong second, with 89 per cent of the listeners correct. The sponsors for five other programs are correctly identified by at least 85 per cent of their listeners: *One Man's Family*, *Major Bowes*, *Jack*

Benny, Fibber McGee, and *General Shafter Parker*. At the other end of the scale, however, are seven programs that are identified only by 35 per cent or less of their audience. These programs, in descending order of audience-identification are: *The Aldrich Family*, *Hobby Lobby*, *Kate Smith*, *Professor Quiz*, *Ask It Basket*, *Knowledge Kollege*, and *Burns and Allen*. The abysmal showing of sponsor identification by the listeners to *Burns and Allen*, where only 6 per cent were correct, was probably due to the fact that these entertainers had just changed sponsors and their audience had not yet caught up.

The relation between the popularity of a program and the percentage of the audience that can successfully identify the sponsor is not high. The rank-difference correlation is only .27.

There is likewise little or no relation between the ability to identify the sponsor of a program and the sex of the listener. A breakdown of the data with regard to age can also be made. For this purpose a table was constructed which displayed the percentage of the audience for each program that correctly identified the sponsor, the audience being fractioned by age and sex. This showed that the younger college group excelled at identifying sponsors, over 80 per cent correctly identifying 12 programs out of 25 listened to by a fourth or more of the available audience. However, there were five or six programs that over 80 per cent of the collegians misidentified. This would indicate a consistently bad announcing practice. With the exception of the youngest, the other age groups were very much alike, in their general level of program identification, 80 per cent or more correctly identifying about 10 programs. It is principally in the non-college age groups that we find a number of programs whose sponsor is identified by from only 20-60 per cent of the listeners. The youngest children, around 10 years of age, had only about five or six programs whose sponsor they nearly all identified; and like the collegians, listened to about five programs the sponsors for which they nearly all missed.

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RELATIONSHIP BETWEEN CHILDREN'S PLAY INTERESTS AND THEIR EMOTIONAL STABILITY*

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In this study both "play interests" and "emotional stability" are defined purely empirically. That is, they are defined in terms of the data at hand. These data involve 938 girls and 862 boys enrolled in the fourth, fifth, and sixth grades of Tennessee and Kentucky public schools located within a radius of 150 miles of Nashville. Each of these children indicated his range of play interests together with his primary play preferences and aversions on a play inventory blank somewhat similar to the Lehman and Witty (3) blank. Then, also, each child responded to an emotionality test or inventory which was first suggested by the senior author (1), and subsequently used by Jagers (2), and others in studies involving the measurement of emotions. The play inventory was developed by the senior author, working in collaboration with representatives of the Department of Physical Education at Peabody College, and was designed to cover types of plays, games, and recreational activities found in the Nashville region. In this study, then, play interests are interpreted in terms of responses made to this particular play inventory, and emotionality refers to scores made on this test of emotionality. Accordingly, the reader should join the authors in recognizing that all references to play interests and emotionality are no more accurate than are the measuring instruments reliable and valid.

In order to test the relationship between the variables in question the highest (most stable) 10 per cent, the lowest (most unstable) 10 per cent, and the middle 20 per cent of cases, as determined by the emotional stability test, were sought for special study. Due to score distributions, exact percentages could not be obtained. The closest possible approximations among boys resulted in 64, or 7.4 per cent, in the highest group; 85, or 9.9 per cent, in the lowest group; and 205, or 23.8 per cent, in the middle group. Among the girls, the closest approximations resulted in 80, or 8.5 per cent, in the highest group; 90, or 9.6 per cent, in the lowest group; and 189, or 20.2 per cent in the middle group. It was believed that if a relationship should exist between the variables under consideration it was logical to assume that it should

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be thoroughly evident in comparisons of such extreme emotionality groups as these.

In Tables 1 and 2 will be seen the activities which were indicated as being liked, in degree, by at least 6 per cent of one of the three emotionality groups. In Table 1 it will be observed that Activities 6, 14, 33, 37, 42, 43, 53, 60, 64, 67, 93, and 96 were liked least by the girls who were lowest in emotionality, and liked most by those with the highest emotionality scores. In Table 2, for boys, the same situation prevails for Activities 17, 22, 29, 41, 42, 55, 59,

TABLE 1
A COMPARISON OF THE PERCENTAGE EXTENT OF PREFERENCE OF PLAY ACTIVITIES LIKED
BEST BY AT LEAST 6 PER CENT OF THE GIRLS OF ANY ONE OF THE THREE
EMOTIONALITY GROUPS

Play activity	Percentages of participation			Probable errors of percentages		
	Low.	Mid.	High.	Low.	Mid.	High.
1. Play tag	12.2	12.7	7.5	2.4	1.6	2.0
3. London Bridge	6.7	6.7	2.5	1.7	1.2	1.1
4. Farmer in the dell	10.0	11.1	3.8	2.2	1.6	1.3
5. In and out the window ..	11.1	9.5	5.0	2.2	1.4	1.7
6. Hide and seek	11.1	13.8	15.0	2.2	1.7	2.7
7. Hopscotch ..	4.4	7.4	3.8	1.4	1.3	1.3
8. Drop the handkerchief	6.7	6.4	2.5	1.7	1.2	1.1
9. Blindfold	13.4	6.4	6.2	2.4	1.2	1.8
10. Postoffice	13.4	11.1	10.0	2.4	1.6	2.3
12. Dodge ball	8.9	13.2	11.2	2.0	1.7	2.4
14. Badminton	1.1	3.2	10.0	0.7	0.9	2.3
17. Golf ..	3.3	3.2	6.2	1.2	0.9	1.8
18. Anty over	12.2	4.2	5.0	2.4	1.0	1.7
22. Play with pet dog or cat	6.7	5.8	8.8	1.7	1.1	2.1
23. Play with dolls ..	16.6	16.4	11.2	2.6	1.8	2.4
26. Play jacks	16.6	12.2	7.5	2.6	1.6	2.0
32. Ride bicycle	54.5	47.8	55.0	3.6	2.5	3.8
33. Skate	33.4	36.0	36.2	3.4	2.4	3.6
35. Hike, or take long walks	12.2	9.0	15.0	2.4	1.4	2.7
37. Dance	18.9	19.1	25.0	2.8	2.0	3.3
40. Fish	6.7	4.8	6.2	1.7	1.0	1.8
42. Swim	16.6	21.8	26.2	2.6	2.0	3.3
43. Ride horseback	23.4	32.8	42.5	3.0	2.3	3.8
48. Jump the rope ...	8.9	9.5	3.8	2.0	1.4	1.3
53. Croquet	4.4	7.4	8.8	1.4	1.3	2.1
56. Baseball ..	6.7	2.6	10.0	1.7	0.7	2.3
60. Tennis	1.1	2.1	8.8	0.7	0.7	2.1
62. Basketball	8.9	4.8	6.2	2.0	1.0	1.8
64. Listen to the radio	3.3	5.8	6.2	1.2	1.1	1.8
65. Play piano, violin, and so forth ..	12.2	10.6	18.8	2.4	1.5	2.9
67. Read books and stories	1.1	4.2	8.8	0.7	1.0	2.1
76. Read Sunday funny paper	5.5	6.4	1.3	1.6	1.2	0.8
93. Go to the movies	16.6	19.6	20.0	2.6	2.0	3.0
96. Watch baseball, or football	1.1	1.6	8.8	0.7	0.5	2.1
97. Take kodak pictures ..	4.4	2.6	6.2	1.4	0.7	1.8
105. Dress up in grown people's clothes	6.7	6.9	1.3	1.7	1.2	0.8

TABLE 2

A COMPARISON OF THE PERCENTAGE EXTENT OF PREFERENCE OF PLAY ACTIVITIES LIKED BEST BY AT LEAST 6 PER CENT OF THE BOYS OF ANY ONE OF THE THREE EMOTIONALITY GROUPS

Play activity	Percentages of participation			Probable errors of percentages		
	Low.	Mid.	High.	Low.	Mid.	High.
1. Play tag	16.4	11.8	6.2	2.7	1.5	2.0
6. Hide and seek	17.6	19.0	4.7	2.8	1.9	1.7
8. Drop the handkerchief	14.1	2.9	0.0	2.6	0.7	0.0
10. Postoffice	15.3	11.2	15.6	2.6	1.5	3.0
12. Dodge ball	8.2	6.8	3.1	2.0	1.1	1.5
15. Marbles	15.3	13.2	10.9	2.6	1.6	2.6
17. Golf	4.7	4.9	9.4	1.5	0.9	2.4
22. Play with pet dog or cat	8.2	8.8	9.4	2.0	1.3	2.4
24. Play with toy airplanes	10.6	9.8	15.6	2.2	1.3	3.0
29. Work with machinery	5.9	9.3	17.2	1.6	1.3	3.1
30. Fly kites	11.8	11.2	9.4	2.3	1.5	2.4
31. Play with bows and arrows	9.4	8.8	1.6	2.1	1.3	0.9
32. Ride bicycle	43.5	38.1	21.9	3.6	2.3	3.4
33. Skate	15.3	5.4	3.1	2.6	1.1	1.5
35. Hike, or take long walks	7.1	9.8	4.7	1.9	1.3	1.7
39. Row a boat	8.2	7.3	10.9	2.0	1.2	2.6
40. Fish	17.1	16.6	26.6	2.8	1.8	3.7
41. Hunt, or shoot just for fun	15.3	23.5	39.1	2.6	2.0	4.1
42. Swim	18.8	25.8	34.4	2.8	2.1	4.0
43. Ride horseback	22.4	28.8	26.6	3.0	2.2	3.7
44. Build things with tools	2.4	1.5	7.8	1.1	0.5	2.2
55. Wrestling	1.2	6.3	9.4	0.7	1.1	2.4
56. Baseball	14.1	17.6	23.4	2.6	1.8	3.6
59. Boxing	8.2	15.1	15.6	2.0	1.8	3.0
60. Tennis	3.5	3.4	9.4	1.3	0.8	2.4
62. Basketball	7.1	13.2	10.9	1.9	1.6	2.6
63. Football	22.4	42.0	45.4	3.0	2.4	4.2
93. Go to the movies	20.0	13.2	14.1	3.0	1.6	3.0
96. Watch baseball, or football	2.4	5.4	12.5	1.1	1.1	2.8

63, and 96. In turn, we find that for girls there is a progressive decrease in interest from the lowest (most unstable) to the highest (most stable) emotionality groups for Activities 5, 8, 9, 10, 23, and 26. For boys this progressive decrease of interest is found for Activities 1, 8, 12, 15, 30, 31, 32, and 33.

If we seek a common element in each of these lists it is difficult to discover with any degree of certainty. In the activities which show an increase of interest from the lowest to the highest groups, 6, 14, 33, 37, 42, 43, 53, 60, and possibly 96, for girls, and 17, 29, 41, 42, 55, 59, 63, and 96, for boys, might be thought of as *active* forms of recreation or play. In other words, these activities might lead us to the conclusion that the unusually stable child, either boy or girl, is more likely to have a major interest in the active, "up-

and-doing," or even vigorous types of activities than is the highly unstable child. In degree, at least, this conclusion is substantiated by the findings with respect to decrease of interest. Thus, Activities 9, 10, 23, and 26, as found in the girls' list, and possibly 1, and 15, in the boys' list, are games with little of an activity aspect. Yet before we accept this generalization, we should note an increase of girls' interest in 64, and 67, and boys' interest in 22 along with an increase in emotional stability, and, conversely, a decrease in girls' interest in 5, and 8, and a decrease in boys' interest in 8, 12, 30, 31, 32, and 33 as emotional stability increases. Most of these are highly active forms of play.

We have further evidence of the precariousness of such a generalization if we list the 10 activities liked best by each emotionality group. If we go through these lists and strike out those activities which are duplicated in another list, in other words, if we eliminate those activities which are highly preferred by children irrespective of emotionality status, we have low girls left only with Activities 9, 10, and 26, and high girls left with 35, hiking, and 65, playing a piano, violin or other musical instrument. Although four of these preferences, 9, 10, 26, and 35, would tend to confirm the idea that emotionally stable children are likely to prefer more active forms of recreation than is the case with the emotionally unstable, Activity 65, playing a musical instrument, certainly offers no support to the hypothesis. With boys this condition is evident in even greater degree because low boys are left with Nos. 1, playing tag, and 33, skating, the former of which may be a fairly active pursuit, and the latter of which is extremely active. In turn, high boys are left with Nos. 24, playing with toy airplanes, and 29, working with machinery, neither of which probably is as vigorously active a form of recreation as is skating.

A still different approach is found if we study the items from the standpoint of those which show statistically significant differences between the extreme groups, along with either a progressive increase or a progressive decrease of preference from the lowest to the highest emotionality group. If we consider first activities which were preferred most by the low group, and least by the high group, and list all for which the critical ratio of the percentage difference is as much as 3.83, we find for boys numbers 8, drop the handkerchief, 32, riding a bicycle, 33, skating, and 6, hide and seek. For girls, there are no activities which meet these criteria. In fact, there are no activities of this type where the critical ratio is as much as 3.00 between the extreme groups of girls. If we turn to those activities which were preferred least by the lowest emotionality groups, and most by the highest, we again find none for the girls

for which the critical ratio of the percentage difference is as much as 3.83. Two of the items, Nos. 41, hunting, and 63, playing football, are the only ones where the boys' extremes apparently reach the point of practical statistical significance. If we lower our criterion of statistical significance to a critical ratio of 3.00, we include, for girls, Nos. 14, badminton, 60, tennis, 67, reading, 96, watching football and baseball, and 43, riding horseback. For boys we add Nos. 55, wrestling, 29, working with machinery, 42, swimming, and 96, watching football and baseball. In the main, of course, this statistical analysis reemphasizes the active nature of the play interests of the emo-

TABLE 3

A COMPARISON OF THE PERCENTAGE EXTENT OF PREFERENCE OF PLAY ACTIVITIES DISLIKED MOST BY AT LEAST 6 PER CENT OF THE GIRLS OF ANY ONE OF THE THREE EMOTIONALITY GROUPS

Play activity	Percentages of participation			Probable errors of percentages		
	Low.	Mid.	High.	Low.	Mid.	High.
1. Play tag	18.9	13.8	13.8	2.8	1.7	2.6
2. Ring around the rosy	30.0	30.1	35.0	3.3	2.3	3.6
3. London Bridge	21.1	12.7	13.8	2.9	1.6	2.6
4. Farmer in the dell	11.1	11.6	11.2	2.2	1.6	2.4
5. In and out the window	8.9	8.5	10.0	2.0	1.3	2.3
6. Hide and seek	3.3	12.7	6.2	1.2	1.6	1.8
7. Hopscotch	13.4	10.6	7.5	2.4	1.5	2.0
8. Drop the handkerchief	1.1	6.4	7.5	0.7	1.2	2.0
9. Blindfold	3.3	6.9	5.0	1.2	1.2	1.7
10. Postoffice	5.5	11.1	17.5	1.6	1.6	2.8
11. Cat and mouse	11.1	15.9	10.0	2.2	1.8	2.3
13. Puss in the corner	8.9	14.3	13.8	2.0	1.7	2.6
15. Marbles	12.2	18.0	8.8	2.4	1.9	2.1
20. Play with fire	25.6	28.0	30.0	3.1	2.2	3.5
21. Play with water	2.2	11.1	10.0	1.0	1.6	2.3
23. Play with dolls	10.0	7.9	11.2	2.2	1.3	2.4
24. Play with toy airplanes	5.5	7.4	6.2	1.6	1.3	1.8
25. Roll hoops	11.1	7.9	5.0	2.2	1.3	1.7
26. Play jacks	6.7	7.9	6.2	1.7	1.3	1.8
27. Spin tops	2.2	5.8	10.0	1.0	1.1	2.3
31. Play with bow and arrows	6.7	6.9	6.2	1.7	1.2	1.8
36. Do garden work	6.7	4.8	2.5	1.7	1.0	1.1
37. Dance	7.8	5.3	3.8	1.8	1.1	1.3
38. Play follow the leader	2.2	6.9	6.2	1.0	1.2	1.8
41. Hunt, or shoot just for fun	6.7	2.6	3.8	1.7	0.7	1.3
45. Snap the whip	3.3	4.8	6.2	1.2	1.0	1.8
49. Leap-frog	12.2	12.2	13.8	2.4	1.6	2.6
55. Wrestling	2.2	6.4	5.0	1.0	1.2	1.7
59. Boxing	3.3	5.3	6.2	1.2	1.1	1.8
70. Checkers	3.3	2.6	6.2	1.2	0.7	1.8
72. Pool or billiards	2.2	1.1	6.2	1.0	0.5	1.8
80. Play "Old Maid"	6.7	5.3	6.2	1.7	1.1	1.8
84. Tiddledy-winks	7.8	2.6	3.8	1.8	0.7	1.3
91. Ride in small wagon or scooter	6.7	1.6	2.5	1.7	0.5	1.1
106. Play mumbly peg	6.7	1.1	2.5	1.7	0.5	1.1

tionally stable child. However, we still find low boys significantly more interested in things such as skating and riding a bicycle than are high boys, and high girls rather significantly more interested in reading than low girls. Of course, there is one other matter which is in evidence with the boys, and that is something more of a tendency for the unstable boy to prefer games that frequently are classified as effeminate or "sissy." Reference is made to games such as drop the handkerchief, and playing tag.

Each pupil indicated his major dislikes as well as his major preferences. Tables 3 and 4 summarize the data in this connection. Here we notice that dislike decreases progressively from the lowest to the highest emotionality groups for items 2, 8, 10, 20, 27, 45, and 59, for girls, and 2, 7, 8, 13, 23,

TABLE 4
A COMPARISON OF THE PERCENTAGE EXTENT OF PREFERENCE OF PLAY ACTIVITIES DISLIKED MOST BY AT LEAST 6 PER CENT OF THE BOYS OF ANY ONE OF THE THREE EMOTIONALITY GROUPS

Play activity	Percentages of participation			Probable errors of percentages		
	Low.	Mid.	High.	Low.	Mid.	High.
1. Play tag	12.9	11.2	9.4	2.4	1.5	2.4
2. Ring around the rosy	31.8	34.1	36.0	3.4	2.3	4.0
3. London Bridge	24.7	19.5	21.9	3.2	1.9	3.4
4. Farmer in the dell ...	25.5	21.0	21.9	3.1	2.0	3.4
5. In and out the window	17.6	13.7	15.6	2.8	1.6	3.0
6. Hide and seek	8.2	3.4	7.8	2.0	0.8	2.2
7. Hopscotch	10.6	17.1	17.2	2.2	1.8	3.1
8. Drop the handkerchief	4.7	15.1	18.8	1.5	1.8	3.2
9. Blindfold	3.5	6.3	4.7	1.3	1.1	1.7
10. Postoffice ..	11.8	7.3	12.5	2.3	1.2	2.8
11. Cat and mouse	4.7	10.8	6.2	1.5	1.4	2.0
12. Dodge ball	3.5	6.8	1.6	1.3	1.1	0.9
13. Puss in the corner	7.1	10.2	10.9	1.9	1.4	2.6
14. Badminton ...	3.5	7.3	4.7	1.3	1.2	1.7
15. Marbles	5.9	6.8	4.7	1.6	1.1	1.7
20. Play with fire	21.2	18.6	18.8	3.0	1.8	3.2
21. Play with water	14.1	3.9	6.2	2.6	0.8	2.0
23. Play with dolls	17.6	24.4	31.2	2.8	2.0	3.9
24. Play with toy airplanes	8.2	3.9	6.2	2.0	0.8	2.0
25. Roll hoops	12.9	5.9	4.7	2.4	1.1	1.7
26. Play jacks	8.2	13.2	10.9	2.0	1.6	2.6
36. Do garden work	9.4	8.8	10.9	2.1	1.3	2.5
37. Dance ..	11.8	10.2	9.4	2.3	1.4	2.4
38. Play follow the leader	2.4	6.3	3.1	1.1	1.1	1.5
45. Snap the whip	5.9	6.8	4.7	1.6	1.1	1.7
48. Jump the rope	9.4	10.2	10.9	2.1	1.4	2.6
49. Leap-frog	7.1	9.3	9.4	1.9	1.3	2.4
65. Play piano, violin, etc. ...	1.2	2.0	9.4	0.7	0.7	2.4
85. Sewing or knitting just for fun ..	5.9	5.4	9.4	1.6	1.1	2.4
99. Play school ..	3.5	6.3	4.7	1.3	1.1	1.7
104. Play bandit	3.5	2.0	7.8	1.3	0.7	2.2
105. Dress up in grown people's clothes	5.9	6.3	3.1	1.6	1.1	1.5

48, 49, and 65, for boys. From these lists we note especially a growing dislike for immature types of play, such as Nos. 2, ring around the rosy, 7, hopscotch, 8, drop the handkerchief, and 13, puss in the corner, as one goes to the higher or better adjusted groups. Also, there is some evidence of less tolerance by each sex of plays ordinarily allocated to the other sex, as one progresses from lower to high emotionality groups. We see this in the growing intolerance of boys for 13, playing with dolls, 48, jumping rope, and 65, playing a musical instrument. With girls we see it especially with 27, spinning tops, and 59, boxing. Before we complete a generalization to this effect, though, we should note that with girls especially we find little supporting evidence from items such as 31, playing with bows and arrows, 41, hunting, or 106, playing mumbly peg.

Girls with low emotionality scores show the greatest dislike, and those with high scores show the least dislike for 7, 25, 36, and 37. With boys the corresponding comparison points to Activities 1, 25, and 37. Item 1 might well be added to the girls' list because low girls are most prone to dislike it whereas average and high girls are tied in their extent of dislike. So we might say that with both sexes those with lowest emotionality scores are more likely to dislike 1, 25, and 37, and those with highest scores are least likely to dislike these activities. No. 1, playing tag, is certainly an immature form of play for these children. No. 25, rolling hoops, on the other hand, certainly is played by children of these ages, and, furthermore, is active, and as ordinarily engaged in by groups, is fairly well socialized. Of course, there is little "point" to the activity, and only a very small modicum of skill required. Dancing, 37, may be said to be a highly socialized form of recreation, requiring certain social graces not necessary in the other forms of play. It seems difficult indeed, however, to find a common element in the results to point toward an influence of emotional status on a child's recreational dislikes.

The likelihood that these more or less isolated associations are fortuitous variations in the data, or sampling phenomena of a type rather than manifestations of basic relationships between the variables in question is strengthened when we study the statistical significance of the differences noted. Thus, when we take those activities which were disliked most by children of either sex with low emotionality scores, and least by children with high scores, we find no item where the percentage difference was as much as 3.00 times its probable error. In turn, when we study the activities disliked most frequently by the stable children and least frequently by the unstable ones, we find only Item 8, drop the handkerchief, for boys, showing a critical ratio of the percentage difference of as much as 3.83, and only five others, 8, 10, 21, and 27,

for girls, and 65, for boys showing a critical ratio of as much as 3.00. It would appear, then, that emotionality, at least as here measured, was not a primary conditioning factor in determining the specific play or recreational dislikes of these children.

Another approach was taken to the problem by attempting to discover whether breadth or extent of play interests might be associated with children's emotional status. The emotional status of the child, as here determined at least, does not hold any predictable relationship to the child's breadth of play interests. Within a sex group the highest critical ratio for a mean difference is 1.42, which, of course, is entirely too low to justify one in attaching much faith to the obtained difference. Probably more important than this, however, is the fact that there is no consistent ascending or descending order in the magnitude of the means as one goes from one emotional extreme to the other. This finding is further substantiated in the girls' data by the coefficient of correlation between emotionality test score and total number of activities enjoyed. It is $+.02 \pm .02$. With boys the corresponding coefficient is somewhat higher than probably would have been expected, being $-.44 \pm .02$. This coefficient as it stands, of course, is not sufficiently high to justify one in believing that he has improved extremely on chance prediction so far as the individual is concerned; the coefficient of alienation is .90. A point which probably is of some significance in interpreting it is the fact that the plotted data indicate that the relationship may be more parabolic than rectilinear. In other words, it is doubtful if either the correlation coefficient or correlation ratio is an adequate measure of the actual relationship existing between the variables. Hence, the authors are prone to interpret the $-.44$ with considerable conservatism, and believe that it is more a statistical phenomenon than an index of a significant relationship.

Viewed in its entirety, this study may appear to be largely negative in its findings. It has sought to discover whether or not there was a relationship between children's avowed play interests and their tested emotionality. In the main, we must conclude that little if any relationship has been discovered. In a few isolated instances preferences or dislikes have appeared to be associated with tested emotionality, but these instances have been so few in number, and the individual activities designated have shown so little in common that the authors are prone to view them more as fortuitous variations in the data, in most cases, than as manifestations of basic trends. So though the results are primarily negative, they also are clarifying if for no other reason than that they tend to dissipate certain commonly found positions frequently encountered in the field.

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RELATION OF THE PLAY INTERESTS OF CHILDREN TO THEIR ECONOMIC STATUS*

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The present analysis involves 1,800 children in the fourth, fifth, and sixth grades in certain Tennessee and Kentucky schools within a radius of 150 miles of Nashville. Both rural and urban cases are included. All records were taken in November and December. It was thought that these matters were of some importance because, in degree at least, they tended to hold constant major regional and seasonal factors which conceivably might affect the play interests and activities of the groups studied. Within the grades there were 265 boys, and 253 girls in the fourth grade; 230 boys, and 296 girls in the fifth grade; and 367 boys, and 389 girls in the sixth grade.

The play interests of the groups were investigated by means of a play inventory of 108 items. This inventory was prepared originally in collaboration with representatives of the Department of Physical Education at Peabody College. It was designed to cover all customarily played games and recreational activities common to the Nashville region. So far as the senior author has been able to determine, during approximately seven years of its use, the inventory is adequate in this region, and usable with upper elementary school children. The child is instructed to go through the test, or inventory, and put a cross (X) in front of every game he likes to play. After he has done this he is told to go back through the inventory and put another cross (XX) in front of the five games or activities he likes best, and a check (✓, or ✓X) in front of the five he dislikes most or likes least. Directions to the child explain this procedure in greater detail than is necessary to present in this discussion. If, for some reason, a child marked four or six of the items instead of five as being liked or disliked in extreme degree, his paper was used the same as though five had been indicated.

The economic status of each child was inferred from a group of data relating to his father's occupation, number of rooms in his home, together with the number of persons occupying these rooms, and the presence or

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absence in the home of a group of items such as the daily paper, electric refrigerator, a separate bathroom, and servants. Scores were assigned positive responses, and a composite economic score was computed for each child. Accordingly, in this discussion when reference is made to children of high or low economic status it is to be understood that reference is made to children with high or low scores on this economic rating scale.

It is altogether likely that this scale at all times may not make precise and entirely valid distinctions between children of only slightly different economic status. Any short scale, as this had to be, suffers from an inadequate sampling of various aspects of social and economic life. At the same time, its use in studies such as those by Coleman (2), Lewis (3), McGehee (4), and Moncreiff (5) indicated that it could be expected to make fairly valid economic, or socio-economic, discriminations, and that the measurements were evidently significant when attention was centered on the differences in the economic extremes. That is, the difference in economic status, for example, between children with scores that put them in the highest fourth on the scale was rather clear-cut as compared with those whose scores put them in the lowest fourth. In the present study the highest 10 per cent,¹ lowest 10 per cent, and middle 20 per cent of cases were selected for special analysis. It was thought that there was little room for believing that the economic scale would not make a definite, and reasonably valid distinction between groups this far removed from each other.

In Tables 1 and 2 one will see a summary of the percentage frequencies of activities liked best by at least 6 per cent of the low, middle, and/or high economic groups, first of girls and second of boys. If economic status has a significant relationship to play interests we probably should expect to find either a progressively increasing or progressively decreasing amount of interest in a play activity as we move from low to average to high economic groups. Accordingly, the consistency of the percentage patterns will serve as a first cue to a possible relationship of the measures in question.

It can be seen in Table 1 that the percentage frequencies of preferences for Activities 14, 22, 35, 37, 41, 43, 53, 60, 63, 65, 67, and 96 show a progressive increase from lowest to highest economic status. In Table 2 the same holds true for Activities 10, 14, 17, 24, 40, 42, 60, 63, 93, and 96. If these activities are studied, it will be seen that practically all of them,

¹These percentages are only approximate in reality. The actual score distributions necessitated using 206 cases in the lowest group, 168 in the highest, and 337 cases in the middle group. Exact frequencies for the percentages in question would have been 180 in each of the extreme groups and 360 in the middle.

TABLE 1
A COMPARISON OF CERTAIN PLAY ACTIVITIES LIKED BEST BY AT LEAST 6 PER CENT OF
THE GIRLS IN ANY ONE OF THE THREE SOCIO-ECONOMIC GROUPS

Play activity	Percentages of participation			Probable errors of percentages		
	Low	Mid.	High	Low	Mid.	High
1. Play tag	9.9	11.5	5.0	1.9	1.6	1.7
2. Ring around the rosy	9.9	2.2	0.0	1.9	0.7	0.0
3. London Bridge	11.7	4.4	1.3	2.0	1.0	0.7
4. Farmer in the dell	17.2	9.3	2.5	2.4	1.5	1.1
5. In and out the window	16.2	6.6	5.0	2.4	1.2	1.7
6. Hide and seek	14.4	14.2	8.8	2.2	1.8	2.1
7. Hopscotch	10.8	9.3	0.0	2.0	1.5	0.0
8. Drop the handkerchief	15.4	6.6	1.3	2.3	1.2	0.7
10. Post office	8.1	17.5	10.0	1.8	1.9	2.3
12. Dodge ball	17.2	7.1	3.8	2.4	1.3	1.3
14. Badminton	0.9	1.6	11.2	0.6	0.5	2.4
22. Play with pet dog or cat	2.7	6.6	8.8	0.9	1.2	2.1
23. Play dolls	11.7	12.0	8.8	2.0	1.6	2.1
26. Play jacks	19.8	14.2	5.0	2.6	1.8	1.7
32. Ride bicycle	45.0	55.2	48.8	3.2	2.5	3.8
33. Skate	30.6	36.6	18.8	3.0	2.4	2.9
35. Hike, or take long walks	8.1	14.8	18.8	1.8	1.8	2.9
37. Dance	17.2	22.9	25.0	2.4	2.1	3.3
41. Hunt, or shoot just for fun	0.9	1.6	21.2	0.6	0.5	3.1
42. Swim	15.4	20.3	40.0	2.3	2.0	3.7
43. Ride horse back	20.7	27.3	35.0	2.6	2.2	3.6
48. Jump the rope	15.4	10.4	7.5	2.3	1.6	2.0
43. Croquet	2.7	4.9	8.8	0.9	1.0	2.1
56. Baseball	8.1	4.4	3.8	1.8	1.0	1.3
60. Tennis	0.9	3.8	8.8	0.6	0.9	2.1
62. Basketball	6.3	3.3	2.5	1.6	0.9	1.1
63. Football	0.9	2.2	10.0	0.6	0.7	2.3
65. Play piano, violin, etc.	9.0	11.5	18.8	1.9	1.6	2.9
67. Read books and stories	4.5	6.0	7.5	1.3	1.2	2.0
93. Go to the movies	9.0	27.3	20.0	1.9	2.2	3.0
96. Watch baseball, or football	0.0	1.1	11.2	0.0	0.5	2.4
105. Dress up in grown peoples clothes	9.0	6.0	5.0	1.9	1.2	1.7
108. Tell fortunes, or have them told	2.7	1.6	7.5	0.9	0.5	2.0

as ordinarily participated in today, demand either a direct outlay of money, as for example going to the movies, or going to ball games, or fishing, much of which is done in private lakes, or they demand the purchase of equipment or materials, as for example badminton, golf, and playing a piano or violin, or they demand a certain leisure or freedom which probably is associated in many instances with economic competency. Illustrative of these latter activities we find hiking, dancing, and reading books.

When Tables 1 and 2 are looked at jointly to discover the activities which for both girls and boys show a progressive increase in preference from lowest to highest economic groups, we find only five, out of a total possibility of 108. These five are: 14, badminton; 42, swimming; 60,

TABLE 2
A COMPARISON OF CERTAIN PLAY ACTIVITIES LIKED BEST BY AT LEAST 6 PER CENT OF
THE BOYS IN ANY ONE OF THE THREE SOCIO-ECONOMIC GROUPS

Play activity	Percentages of participation			Probable errors of percentages		
	Low	Mid.	High	Low	Mid.	High
1. Play tag	17.9	10.4	10.2	2.6	1.7	2.2
6. Hide and seek	20.0	14.3	11.4	2.8	1.9	2.3
8. Drop the handkerchief	6.3	3.3	0.0	1.7	0.9	0.0
10. Post office	9.5	12.4	13.6	2.0	1.8	2.4
14. Badminton	0.0	1.3	9.1	0.0	0.6	2.1
15. Marbles	19.0	9.1	10.2	2.8	1.6	2.2
17. Golf	4.2	4.6	9.1	1.3	1.1	2.1
24. Play with toy airplanes	5.3	11.7	12.5	1.6	1.8	2.4
29. Work with machinery	4.2	9.8	6.8	1.3	1.6	1.8
30. Fly kites	12.6	12.4	4.5	2.3	1.8	1.4
31. Play with bow and arrows	10.6	6.5	3.4	2.1	1.3	1.3
32. Ride bicycle	44.2	37.7	33.0	3.4	2.6	3.4
33. Skate	14.8	13.0	0.0	2.4	1.9	0.0
39. Row a boat	9.5	7.8	6.8	2.0	1.4	1.8
40. Fish	13.7	22.1	25.0	2.4	2.2	3.2
41. Hunt, or shoot just for fun	14.8	25.4	25.0	2.4	2.4	3.2
42. Swim	21.1	23.4	37.5	2.9	2.3	3.5
43. Ride horseback	29.5	27.3	30.7	3.2	2.4	3.3
55. Wrestling	5.3	3.9	10.2	1.6	0.9	2.2
56. Baseball	22.1	15.0	19.4	2.9	2.0	2.8
60. Tennis	1.1	2.6	9.1	0.7	0.8	2.1
62. Basketball	10.6	8.5	17.1	2.1	1.5	2.8
63. Football	25.2	41.5	65.0	3.0	2.7	3.4
93. Go to the movies	13.7	16.2	17.1	2.4	2.0	2.8
96. Watch baseball or football	0.0	9.1	12.5	0.0	1.6	2.4

tennis; 63, football; and 96, watching ball games. Manifestly, each of these five activities definitely costs money, as engaged in by the ordinary child. Swimming, the one of the five which some might classify differently, to an appreciable degree is in pools which charge admission. So it would appear that if economic sufficiency has any influence on the child's play interests it is largely from the point of view of opening additional possibilities of participation to him.

As found in Tables 1 and 2, it will be seen that there is a progressive decrease in major interest, for girls, in Activities 2, 3, 4, 5, 6, 7, 8, 12, 26, 48, 56, 62, and 105, and for boys in Activities 1, 6, 8, 30, 31, 32, 33, and 39. Although Nos. 26, playing jacks, 30, flying kites, 31, playing with bows and arrows, 32, riding a bicycle, 33, skating, 39, rowing a boat, 56, baseball, and 62, basketball probably cost the child, or his family, something if he plays them, the fact remains that the cost is rather negligible for most of the items, except 32, 39, 62, and, questionably, 33, and 56. When the 21 activities mentioned in the first part of the paragraph are looked at as

a whole we find them in the main to be activities which the child of low economic status can afford to like,—activities in which his economic impoverishment is no handicap.

Obviously, the difference in per cent of cases which expressed a major interest in some of the aforementioned activities is quite small. When we seek to find those where there not only is a progressive increase or decrease in the percentages, from lowest to highest economic groups, but also a statistically reliable difference in the percentage frequencies of the extremes, we find a very small list of items indeed. If we list all of these activities which have a critical ratio of as much as 3.83 for the percentage difference between the high and low economic groups, we find among the activities liked more by the highest economic group than by the lowest, the following (Table 3):

TABLE 3

Girls	Boys
14—Badminton (4.16)*	14—Badminton (4.33)
41—Hunting (6.43)	63—Football (8.78)
42—Swimming (5.64)	96—Watching ball games (5.21)
63—Football (3.83)	
96—Watching ball games (4.67)	

*The critical ratio of the percentage difference is put after each activity in parenthesis.

In turn, the activities which were liked more by those of lowest economic status than by those of highest status are indicated in Table 4.

TABLE 4

Girls	Boys
2—Ring around the rosy (5.21)	33—Skating (6.17)
3—London Bridge (4.91)	
4—Farmer in the dell (5.56)	
7—Hopscotch (5.40)	
8—Drop the handkerchief (5.86)	
12—Dodge ball (4.91)	
26—Play jacks (4.76)	

These analyses of the statistical significance tend to point to two interpretations. First, they substantiate, in fact, markedly accentuate, the point made earlier that where economic status is of significance in the play preferences of divergent economic groups it is seen in the high economic group's greater interest in activities which call upon the child's economic resources, and in the low economic group's greater interest in activities in which they can participate fully without financial outlay, or with a

very meagre financial requirement. The second point is that whereas only 36 of the 108 activities showed either a progressive increase or decrease of major preference, this number of activities is reduced to 13 for which there is a statistically significant difference between the extreme economic groups. Thus, it would seem that economic status cannot be expected to have any very consistent and significant relationship to play interests *as a whole*. Where such a relationship does exist it appears to be rather specific for particular activities. In the main, children of all economic strata express a considerable interest in costly activities, even though they may not be able to afford them.

In Table 5 the reader will find summaries of the major play dislikes of the children in the three economic groups. A study of Table 5 will show that there is a progressively increasing dislike, among girls, for Activi-

TABLE 5
A COMPARISON OF CERTAIN PLAY ACTIVITIES DISLIKED MOST BY AT LEAST 6 PER CENT OF THE GIRLS IN ANY ONE OF THE THREE SOCIO-ECONOMIC GROUPS

Play activity	Percentages of participation			Probable errors of percentages		
	Low	Mid.	High	Low	Mid.	High
1. Play tag	18.0	13.1	13.8	2.5	1.7	2.6
2. Ring around the rosy	19.8	31.6	27.5	2.6	2.4	3.4
3. London Bridge	13.5	13.1	12.5	2.2	1.7	2.5
4. Farmer in the dell	7.2	9.3	13.8	1.7	1.5	2.6
5. In and out the window	10.8	12.6	11.2	2.0	1.7	2.4
6. Hide and seek	8.1	7.1	3.8	1.8	1.3	1.3
7. Hopscotch	10.8	9.8	8.8	2.0	1.5	2.1
10. Post-office	10.8	12.0	18.8	2.0	1.7	2.9
11. Cat and mouse	9.0	8.7	15.0	1.9	1.4	2.7
13. Puss in the corner	9.0	12.6	10.0	1.9	1.7	2.3
15. Marbles	19.8	14.8	10.0	2.6	1.8	2.3
20. Play with fire	21.6	28.0	23.8	2.6	2.3	3.2
23. Play with dolls	8.1	10.9	13.8	1.8	1.6	2.6
25. Roll hoops	9.9	8.7	6.2	1.9	1.4	1.8
26. Play jacks	9.0	7.1	1.3	1.9	1.3	0.8
28. Walk on stilts	7.2	3.3	1.3	1.7	0.9	0.8
30. Fly kites	8.1	2.7	1.3	1.8	0.7	0.8
35. Hike, or take long walks	6.3	1.1	1.3	1.6	0.5	0.8
37. Dance	6.3	2.2	1.3	1.6	0.7	0.8
38. Play follow the leader	2.7	8.2	1.3	0.9	1.4	0.8
45. Snap the whip	7.2	6.0	10.0	1.7	1.2	2.3
49. Leap-frog	9.9	12.6	16.2	1.9	1.7	2.8
50. Fox and hounds	4.5	1.6	7.5	1.3	0.5	2.0
59. Boxing	2.7	4.9	11.2	0.9	1.0	2.4
102. Play mama and papa	2.7	4.9	10.0	0.9	1.0	2.3
105. Dress up in grown people's clothes	3.6	3.8	6.2	1.1	0.9	1.8
107. Climb trees, porches, and so forth	6.3	4.4	3.8	1.6	1.0	1.3

TABLE 5 (*continued*)
 A COMPARISON OF CERTAIN PLAY ACTIVITIES DISLIKED MOST BY AT LEAST 6 PER CENT OF
 THE BOYS IN ANY ONE OF THE THREE SOCIO-ECONOMIC GROUPS

Play activity	Percentages of participation			Probable errors of percentages		
	Low	Mid.	High	Low	Mid.	High
1. Play tag	16.8	13.0	5.7	2.6	1.9	1.6
2. Ring around the rosy	27.4	33.1	29.5	3.1	2.6	3.3
3. London Bridge	20.0	22.1	19.4	2.8	2.3	2.8
4. Farmer in the dell	15.8	18.8	21.6	2.5	2.1	3.0
5. In and out the window	12.6	20.1	7.9	2.3	2.2	1.9
6. Hide and seek	12.6	7.1	3.4	2.3	1.4	1.3
7. Hopscotch	17.9	16.2	21.6	2.6	2.0	3.0
8. Drop the handkerchief	10.6	9.1	18.2	2.1	1.6	2.8
11. Cat and mouse	8.4	10.4	5.7	1.9	1.7	1.6
12. Dodge ball	9.5	5.9	1.1	2.0	1.2	0.7
13. Puss in the corner	5.3	10.4	15.9	1.6	1.7	2.6
14. Badminton	11.6	2.6	5.7	2.2	0.8	1.6
15. Marbles	6.3	2.6	11.4	1.7	0.8	2.3
16. Duck on rock	6.3	3.9	1.1	1.7	0.9	0.7
18. Anty over	6.3	2.6	2.3	1.7	0.8	1.0
20. Play with fire	15.8	18.2	23.8	2.5	2.1	3.0
21. Play with water	6.3	5.9	2.3	1.7	1.2	1.0
22. Play with pet dog or cat	7.4	3.9	1.1	1.8	0.9	0.7
23. Play with dolls	11.6	23.4	34.1	2.2	2.3	3.4
24. Play with toy airplanes	10.6	3.3	5.7	2.1	0.9	1.6
26. Play with jacks	9.5	14.3	15.9	2.0	1.9	2.6
36. Do garden work	7.4	4.6	15.9	1.8	1.1	2.6
38. Play follow the leader	2.1	5.2	7.9	1.0	1.2	1.9
48. Jump the rope	8.4	9.8	12.5	1.9	1.6	2.4
49. Leap-frog	10.6	5.2	12.5	2.1	1.2	2.4
85. Sewing or knitting, just for fun	3.2	3.9	14.8	1.2	0.9	2.5
99. Play school	3.2	9.8	9.1	1.2	1.6	2.1
102. Play mama and papa	3.2	3.3	7.9	1.2	0.9	1.9

ties 4, 10, 23, 49, 59, 102, and 105, and, among boys, for Activities 4, 13, 20, 23, 26, 38, 48, 85, and 102, as one goes from the lowest to the highest economic groups. In the main, a study of these activities will show that they can be engaged in without cost, or, at least, with a minimum financial outlay. It would appear, then, that as the child becomes more economically sufficient he can afford to develop certain dislikes that would handicap him if, for economic reasons, his range of play interests were curtailed.

When we look at the activities which seem to be disliked most often by those of lowest economic status, and least often by those of highest status, we find, for girls, Nos. 3, 6, 7, 15, 25, 26, 30, 37, and 107, and, for boys, Nos. 1, 6, 12, 16, 18, 21, and 22. Some of these, as for example boys of highest status disliking to play tag less than other boys, may come as a surprise to some readers. A further study of the reports makes it evident that some of this was due to an evident tendency for the more economically

sufficient children to ignore these activities altogether. On the other hand, before one generalizes too extensively from any of these data with respect to major dislikes, notice should be taken of the statistical significance of observed percentage differences.

If we select those activities which are disliked least often by those of lowest economic status as compared with those of highest, and for which there is a critical ratio of at least 3.83 for the difference in the percentages of dislike indicated by the lowest and highest economic groups, we have the results indicated in Table 6.

TABLE 6

Girls	Boys
None	20—Playing with dolls (5.55) 85—Sewing or knitting (4.19)

In turn, the activities in the group which were disliked most often by the children of lowest economic status, as compared with the other economic extreme, and for which there is a *CR* of 3.83, are indicated in Table 7.

TABLE 7

Girls	Boys
None	12—Dodge ball (3.96)

Looked at as a whole, then, we find no activity which is disliked in a progressively different and statistically significant manner by the three economic groups of girls under consideration. Further, on only three of the activities, 20, 85, and 12, do we find such differences for boys. Out of a possibility of 216 such differences, therefore, we find a total of only three. It would seem to raise the question very pertinently as to whether these three differences may not have arisen as a result of chance samplings or fortuitous variations in the basic data. In any event, we would seem to have little basis in these findings to assume that children of widely different economic status will show any patterned and appreciable differences, in general, in their play or recreational dislikes. If we were correct in concluding that economic status has only a very minor or weak relationship to play preferences, it would appear evident that there is even less relationship between the child's economic background and his play dislikes.

Since economic status did not appear to have a more definite relationship to particular likes and dislikes than has been noted, it was thought that it might be related to the total number of play activities indicated as being

TABLE 8
ANALYSIS OF NUMBER OF PLAY ACTIVITIES ENJOYED BY CHILDREN OF DESIGNATED
SOCIO-ECONOMIC STATUS

Sections on basis of socio-economic rating scores	Mean number of play activities enjoyed		PE_m	
	Girls	Boys	Girls	Boys
All children	52.6	51.2	0.44	0.48
Lowest 10%	54.5	51.2	1.23	1.34
Middle 20%	51.2	48.4	1.01	1.12
Highest 10%	51.5	53.0	1.37	1.28

liked, or to the extensiveness of play interests. In Table 8 will be seen certain summary data bearing on this point. For boys, the greatest difference in mean number of games liked was between the lowest and middle groups. This amounted to 3.3 games. The probable error of the difference, however, was 1.59, which resulted in a critical ratio of only 2.08, certainly not large enough to be unequivocal in meaning. For girls, the greatest difference is between the highest and middle economic groups. First, it should be noted, though, that there is no progressively increasing or decreasing relationship between economic status and extent of play interest, as represented in the means of the groups under investigation. The greatest mean difference, 4.6, is 2.71 times its probable error of 1.70. So again we have a difference which appears to be neither logically nor statistically significant.

When this latter problem is approached from a correlational point of view, we find substantiating evidence for the foregoing conclusions. The correlation between economic status and number of activities enjoyed, for boys, is $.02 \pm .02$, and, for girls, $.05 \pm .02$. In order to see whether chronological age was influencing the coefficients, a first-order partial was run, holding constant *CA*. The resulting coefficients are, for girls, .01, and, for boys, .01. When mental ability, as measured by a psychometric examination, was held constant, the coefficients were .05, and .01, in above order. When emotional stability as measured by test, was held constant, the coefficients, in the same order, were .05, and .13. So it would seem that not only do we have no evidence of extensity of play interests being associated with economic status, but, also, we have no evidence of this relationship having been influenced by the chronological ages, tested intelligence, or, appreciably by the emotionality of the children under investigation.

In conclusion, it would appear evident that the data of this study give scant indication of economic status being associated with children's general play and recreational interests to any marked degree. When boys and girls are

THE ACADEMIC AND VERBAL ADJUSTMENT OF COLLEGE AGE BILINGUAL STUDENTS*

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The bilingual problem is so complicated that before one can undertake an investigation of any specific phase of the question it becomes necessary to delimit the area in which any given study is to function. Yet a survey of the history of the problem is so space consuming that the interested reader is referred to the excellent history presented in Arsenian (1), or to the extremely thorough review of the European situation gathered by Toussaint (16). Here we shall content ourselves with merely a brief summary of the conclusions to which one is inevitably led by a survey of the historical field.

1. The developmental studies of individual bilingual children seem to support the theory that bilingualism has no retarding effect if the sources of the languages are distinct and consistent. These studies were made, however, on superior children and whether the same results would hold for normal or inferior children is still to be determined.

2. Smith's (8) extensive study made in Hawaii supported the theory that for the pre-school child bilingualism was responsible for language immaturities, but that incorrect English was a result of the "pidgin English" heard by the children. The inadequacy of the bilingual background makes these results dubious in so far as application to American problems is concerned.

3. Studies of the relation of intelligence and bilingualism based on verbal tests of intelligence are particularly unsatisfactory, and the highly contradictory results found make them difficult to evaluate. No real conclusions can be drawn from them.

4. The work which has been done by correlation techniques, where intelligence and degree of bilinguality have been correlated, establishes little if any connection between the two. Arsenian (1), in particular, is responsible for very thorough work in this field.

5. Comparisons of verbal and non-verbal tests of intelligence made on the same bilingual children began to clarify the picture, and point clearly in the direction of a language handicap, which has given (in the case of verbal tests) an appearance of lesser ability for the bilingual child. In pointing out the

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unsatisfactory nature of verbal tests they probably explain why the verbal tests, used by themselves, have contributed such conflicting evidence.

6. Following this finding of a language handicap by investigating the effect of bilingualism on vocabulary and reading ability, the evidence for the most part is consistent with the hypothesis that for the elementary school child there is some language retardation. Too little material is available to determine whether this handicap continues at the high school and college level. The evidence, especially that of Terman (13), makes it seem probable that the vocabulary handicap does not function after the age of 12.

FIELD OF THIS PARTICULAR STUDY

Because any survey of the history of the bilingual problem must of necessity eventuate in the collection of conflicting data, it seemed that several of the aspects of the question needed investigation. One of these was the problem of the effect of bilinguality on verbal tests of intelligence, another the question of the academic success of the bilingual student, and a third the question of whether bilinguality becomes stabilized at any point in the individual's development. The college level was chosen for this study with this latter aspect of the question in mind, for if stabilization does occur it should be before the college age. Moreover the college age was chosen because of the lack of previous investigations at this level, especially since the only extensive ones are the Welsh studies (6, 7), where the problem is quite different since in Wales both languages spoken by the bilingual child are indigenous languages.

In this investigation¹ two groups were used, the Survey Group for the purpose of delimiting the most promising areas, and the Intensive Study Group for a more careful investigation of the promising problems. Only a small portion of the Intensive Study Group material will be considered here, for the most promising material seemed to lie in the field of problems of personal adjustment considered elsewhere (11).

THE SUBJECTS

The Survey Group consisted of all the bilingual freshmen enrolled at American International College in the fall of 1939 and in the fall of 1940. In the fall of 1939, 17 per cent of the incoming freshmen were found to have been bilingual in childhood, a total of 36 freshmen of whom 12 were women and 24 were men. In the fall of 1940 it was found that 19.9 per cent of the entering freshmen were bilingual, a total of 34 students, 12 of whom were

¹This study represents a portion of a doctoral dissertation submitted at Clark University, sponsored by Dr. Donald Super (10).

women and 22 men. One of the men being over-age he could not be matched with a control and the number of men was reduced to 21. Thus in the two years there was a total of 69 students available who were bilingual, 24 women and 45 men. (This proportion of men and women is consistent with the usual sex-ratio found at the college.)

The Intensive Study Group consisted of 35 students entering in the fall of 1941, 22.8 per cent of the class. Two were too old to match with controls, and one bilingual student left college before the end of the second week of school. There were, then, 32 students in the Intensive Study Group, 21 men and 11 women.

For the purposes of this investigation students' were classified as bilingual if they spoke two languages in childhood, having learned both of them at or before their entrance into first grade. Those who no longer spoke or understood the second language were excluded on the theory that they were probably only slightly bilingual even as children. The languages included in the two groups were: Armenian, French, Finnish, German, Greek, Italian, Lithuanian, Polish, Portuguese, Russian, Swedish, Syrian, Ukrainian, and Yiddish.

THE MATCHING OF THE GROUPS

In the Survey Group each bilingual student was matched on the basis of the Henmon-Nelson *Test of Mental Ability* (3) with a control subject of the same sex, and as nearly as possible the same age. It was not possible in the Survey Group to hold socio-economic status constant because of the lower status of the bilingual students, but the factor was kept as well equated as possible. The average age of the bilingual students was 18-7.5, that of the controls 18-8. The average score of the bilingual students on the Henmon-Nelson Test was 40.93, that of the control group 40.86.

The Intensive Study Group was matched in the same way, but in this group it was possible to hold socio-economic status constant as well, thus these students' were matched with controls for Henmon-Nelson score, age, sex, and socio-economic status.

VALIDITY OF THE HENMON-NELSON TEST AS A BASIS FOR MATCHING

Since the Henmon-Nelson Test was used as a basis for matching it is necessary to consider whether the bilingual students could have been handicapped in any way in taking this test. The test has five types of problems, of which two are language items. If we can show that the bilingual group did not differ significantly in the number of items attempted and the number successfully passed, nor in the percentage of their total score resulting from

each type of problem, then it can be assumed that bilinguality did not greatly influence the test performance. The types of material are vocabulary and word relations; number series and number relations; and finally the recognition of similarities in geometric forms.

1. *Items Attempted and Items Passed Successfully*

Table 1 shows the number of items attempted and the number successfully

TABLE 1
NUMBER OF ITEMS ATTEMPTED AND NUMBER PASSED IN BILINGUAL AND CONTROL GROUPS
ON HENMON-NELSON TEST OF MENTAL ABILITY

Type of item	No. attempted		No. passed		Per cent passed		Critical ratio
	Bil.	Con.	Bil.	Con.	Bil.	Con.	
Vocabulary	1313	1330	868	863	66.1%	64.8%	.16
Word relations	565	549	216	222	39.2%	40.8%	.19
Number series	903	880	618	577	68.4%	65.5%	.46
Arith. relations	877	859	617	625	70.3%	72.8%	.32
Visual form	888	878	506	533	56.9%	60.7%	.45

passed by both the bilingual and the control groups. As can be seen the differences were all insignificant, the bilingual group passing a slightly higher proportion of vocabulary items, which is the portion of the test which would have been expected to reveal a verbal handicap. There is clearly no penalizing of the bilingual group in this regard.

2. *Percentage of Final Score Made on Each Type of Item*

The next problem is that of the rôle played in the final score by each type of item. This information is summarized in Table 2. Here again, contrary

TABLE 2
PER CENT OF FINAL SCORE MADE ON EACH TYPE OF PROBLEM

Type of item	Bilingual	Control	Critical ratio
Vocabulary	30.7%	30.6%	.01
Word relations	7.7%	7.9%	.04
Number series	21.9%	20.5%	.16
Arithmetic relations	21.8%	22.1%	.04
Visual form	17.9%	18.9%	.15
Total	100.0%	100.0%	

to expectation if a bilingually-derived verbal handicap is present, the smallest differences between the two groups were in verbal items. The size of the critical ratios again demonstrates that none of these differences were significant. Therefore when viewed from the angle of the per cent of the final score made

on each type of problem the bilingual group again was shown not to be handicapped in taking the Henmon-Nelson *Test of Mental Ability*.

METHOD OF STUDY

For purposes of the preliminary survey of the effect of bilinguality at the college level, after justifying the method of matching, the following topics were investigated in the Survey Group. (a) Each bilingual and each control student was given an individual verbal test of intelligence (Form L of the Terman-Merrill Revision of the Stanford Binet Intelligence Test). (b) Each bilingual and each control student was given the Purdue Placement Test in English to determine his level of English achievement. (c) In the 1939 group each student was given the Nelson-Denny *Reading Test* to ascertain the effect of bilinguality on this skill. Because the results for the two groups were so similar, and because there was an adequate reading section in the Purdue Test the Nelson-Denny was used only during the first year. (d) Each student was followed through his or her freshman year, a record being made of the academic achievement.

Two sections of the work done with the Intensive Study Group were applicable to the phases of the question being reported here. (a) Because the Survey Group bilingual students did consistently better academic work than their controls, the pre-college academic records of all students in the Survey and Intensive Study Groups were investigated. (b) Because the bilingual students tended in the Survey Group to have higher vocational aspirations the vocational interests of the Intensive Study Group were investigated by means of the Strong *Vocational Interest Blank*. It was felt that it would thus be possible to determine the adequacy of their aspiration and to discover whether there were any differences between the groups in their prospects for finding satisfaction in their chosen work. As has been stated the major part of the work with the Intensive Study Group was concerned with emotional adjustment, reported elsewhere (11).

DOES BILINGUALITY AFFECT PERFORMANCE ON A VERBAL INTELLIGENCE TEST?

In order to investigate the possibility that bilingual students, even at the college level, are handicapped by a verbal test of intelligence each student in the bilingual and in the control group was given an individual intelligence test, Form L of the Terman-Merrill Revision of the Stanford Binet (15). All but five of the tests were given by the investigator, these five were given

by psychology majors in their senior year who had satisfactorily completed the testing course under the investigator's supervision.

Terman himself recognizes the highly verbal nature of this scale, stating (15, p. 3) that,

Our efforts to increase the number of non-verbal tests were successful chiefly at the lower levels. . . . Language, essentially, is a shorthand of the higher thought processes, and the level at which this shorthand functions is one of the most important determinants of the level of the processes themselves.

The average intelligence quotient of the bilingual students at the college level in the present study was 121.99, while that of the control group was 124.74. Although this shows a difference of 2.75 *IQ* points the critical ratio of only 1.10 shows that it is not a significant difference.

One verbal factor seemed to be the cause of a possible difference in the quotients of the two groups, that factor being the vocabulary score. According to Terman (15, p. 302), "we have found the vocabulary test to be the most valuable single test in the scale . . . it agrees to a high degree with the mental rating on the scale as a whole." Considering this in our two groups of students it was found that the average vocabulary score of the bilingual students was 25.7, while that of the control group was 26.7 words. This is a difference of just one word, having a critical ratio of 1.31. However, 26 words is the number required for scoring on vocabulary at Superior Adult Level II, thus "on the average" the bilingual students failed to score on this test by .3 of a word. In order to discover whether this actually had had an effect the test blanks were reviewed and in every case where a student in either group had failed by one word to score at any vocabulary level the number of *IQ* points thus lost was tabulated. The results showed that both bilingual and control groups had lost exactly 42 points in this manner, so that actually the average difference in vocabulary did not affect the final score.

Table 3 shows the per cent passing each item on the Terman-Merrill Revision of the Stanford Binet Scale. The percentages are not, in every instance, based on a total of 69 cases, since at the upper levels some of both groups had already failed all of the tests at a lower level. During the second year all students were given the entire scale regardless of failures. The critical ratios were not determined in Table 3 unless the differences between the percentages were over 10 points.

At the Average Adult Level it is clear that in three tests, all dealing with verbal items, the differences favoring the control group were either significant or approached significance. The only other level at which any differences

TABLE 3
PER CENT PASSING EACH ITEM ON THE TERMAN-MERRILL REVISION OF THE STANFORD
BINET

	Test item	Bilingual	Control	Critical ratio
XIV.	1. Vocabulary	100%	100%	
	2. Induction	87%	85%	
	3. Absurdity	98%	98%	
	4. Ingenuity	97%	94%	
	5. Direction	86%	86%	
	6. Abstract words	100%	100%	
A.A.	1. Vocabulary	97%	100%	
	2. Codes	64%	67%	
	3. Different abstract words	87%	93% 2.88
	4. Arithmetic reasoning	77%	78%	
	5. Proverbs	82%	96% 2.64
	6. Ingenuity	72%	65%	
	7. Sentence memory	58%	76% 2.38
	8. Reconciling opposites	67%	76%	
SA I	1. Vocabulary	74%	83%	
	2. Enclosed boxes	57%	58%	
	3. Minkus completion	58%	52%	
	4. Reversed digits	61%	55%	
	5. Sentence building	58%	65%	
	6. Essential similarities	89%	85%	
SA II	1. Vocabulary	49%	58%	
	2. Reasons II.	66%	63%	
	3. Digits	42%	47%	
	4. Proverbs II.	69%	78%	
	5. Reconciling opposites II.	61%	66%	
	6. Memory passage	56%	54%	
SA III	1. Vocabulary	20%	24%	
	2. Directions II.	38%	50% 1.41
	3. Opposite analogies	36%	28%	
	4. Paper cutting II.	19%	34% 1.76
	5. Reasoning	26%	39% 1.63
	6. Digits	18%	26%	

were large was Superior Adult III, and here none of the critical ratios was above 1.76. From this analysis of the individual items of the Terman-Merrill Revision of the Stanford Binet it would seem that the differences between the groups, although small, are for the most part due to verbal factors.

THE ENGLISH ABILITY OF BILINGUAL STUDENTS

The English Department of American International College made available to the investigator the scores of all freshmen on the Purdue Placement Test in English (4). This is used during the college freshman orientation period as a means of sectioning incoming students. Here the results were divergent

from expectation, the control group had an average score of 129.87, while the bilingual students surpassed them with a score of 136.38, although the critical ratio was only 1.18.

When the number scoring in the upper 10 per cent on the Purdue Test was considered it was found that the bilingual students had an advantage in this respect as well. Twenty and three-tenths per cent of the bilingual students were in the upper 10 per cent, while only 11.6 per cent of the control students scored that high. Although the critical ratio was only 1.41, the fact that the control group's 11.6 per cent was nearer the expected 10 per cent would seem to suggest that some factor of advantage was at work among the bilingual students. This was, of course, contrary to their slight verbal disadvantage on the Binet Scale.

Since there is always a possibility that the superiority of a group would lie within some single segment of an examination it seemed wise to break this test down into its constituent parts and compare the average scores on each section of the test. The results of this breakdown are tabulated in Table 4.

TABLE 4
BREAKDOWN OF THE PURDUE PLACEMENT TEST IN ENGLISH

Section of the test	Average scores		Critical ratio
	Bil.	Con.	
I. Punctuation	16.5	15.7	.84
II. Grammatical classification	11.0	10.9	.12
III. Identification grammatical errors	19.2	17.1	2.34
IV. Sentence structure	18.5	19.1	.76
V. Reading	12.8	12.0	.53
VI. Vocabulary	16.0	17.1	.84
VII. Spelling	41.7	37.7	2.08

Except in Sentence Structure and Vocabulary the bilingual student holds his superiority on all subtests, and both of these had small critical ratios. In Identification of Grammatical Errors and Spelling the critical ratios, although not significant, were relatively high and favored the bilingual group. The slight superiority of the control group in Vocabulary was almost exactly the same as the difference shown in the Binet Scale, and, as we shall see, on a test of reading.

One other approach to the question of English ability is possible, a comparison of the grades received in English by the two groups. In the first semester the average grade in English of the bilingual students was 76.4, of the controls 75.8, the critical ratio being .39. In the second semester the bilingual average rose to 77.3, the control average fell to 75.0, the critical

ratio becoming 1.34. Here again, although the difference is small, it is in the direction of the bilingual student as the better student in English.

READING AND BILINGUAL STUDENTS

A preliminary investigation of six upperclassmen in 1938 had suggested that there might be a tendency on the part of bilingual students to develop a reading disability. Consequently during the first year, that is with the 1939 freshmen, the Nelson-Denny Reading Test (5) was used as a part of the investigation. The average score of the bilingual group was 64.8, that of the control group 60.1, the critical ratio of .24 showing this to be insignificant.

There are two subdivisions in the Nelson-Denny *Reading Test*, one concerned with vocabulary and the other with paragraph reading. It is interesting to note that the control group continued to hold its small superiority in vocabulary here, having an average of 29.6 words as opposed to 29.2 words for the bilingual students. On the reading section the average of the control students was 36.5, compared with 35.6 for the bilingual students.

One more approach will demonstrate the high degree of similarity for the two groups in reading ability. According to the norms given in the test the "level of reading ability" for the groups would be as is shown in Table 5. There is almost no difference as can be seen.

TABLE 5
READING LEVEL ON NELSON-DENNY TEST

Level	Bilingual number	Control number
Elementary school	4	5
High school	17	17
College	15	14
Total	36	36

Because of this high degree of similarity the Nelson-Denny *Reading Test* was not used after the first year of the investigation. But referring to the Reading Section of the Purdue Placement Test we see that the critical ratio between the scores of the two groups in reading ability was only .53. Quite clearly the bilingual student, at the college level, is not handicapped so far as reading ability is concerned when compared with his monolingual control.

THE ACADEMIC STANDING OF BILINGUAL STUDENTS

The next question to be considered is that of the academic standing of the bilingual students. Since much college work is verbal in nature (long reading

assignments, lecture method of instruction, and written essay type examinations), it is easy to see how even a slight verbal handicap might function to lower the academic standing of bilingual students. Therefore the average grades at the end of the first and second semesters were tabulated, the comparison in Table 6 presenting the results. Only 64 of the original 69 pairs

TABLE 6
AVERAGE SEMESTER GRADES

Semester	Average grade Bilingual	Control	Critical ratio
First semester	73.7	71.7	1.26
Second semester	77.1	72.7	2.61

of students finished the first semester, and by the end of the second semester there were only 51 pairs left.

Although the first semester difference was not significant, that for the second semester approached significance, and since averages alone never tell the whole story the grades have been divided in order to show wherein the differences between the groups really lie (see Table 7).

TABLE 7
AVERAGE SEMESTER GRADES BY DECILES

Grade	First semester			Second semester		
	Bilingual	Control	Critical ratio	Bilingual	Control	Critical ratio
90 — 100	0	0	0	2%	4%	.59
80 — 89	31%	13%	2.52	35%	12%	2.65
70 — 79	42%	48%	.68	45%	55%	1.02
60 — 69	17%	33%	2.13	18%	15%	.41
Below 60	10%	6%	.85	0%	14%	2.83
Total	100%	100%		100%	100%	

Because of the approach to significance of the differences in academic ability in the Survey Group it seemed of interest to trace the pre-college records of the students, both in the Survey Group and in the Intensive Study Group, to discover whether the same differences held at the high school and elementary school levels. Since in this case one would be studying the pre-college records of the same students who were investigated at the college level the findings would reflect not merely the result of higher selectivity in the college years. This latter might well have been the case had the method used been that of studying the high school or elementary school records of other groups of bilingual and control students.

Owing to the fact that the school system from which the majority of the students in the experimental population were drawn refused to grant permission to examine the school department records, it was possible to use only the transcripts of high school marks which were available in the registrar's office at the college. These records were examined for the bilingual and control students of both the Survey and Intensive Study Groups, making a total of 101 bilingual students, and 101 controls. It will be noted that in Table 8 that for the second semester of college there were only 51 cases.

TABLE 8
ACADEMIC RECORD BY YEARS FOR BILINGUAL AND CONTROL STUDENTS

Year in school	Average grade		Critical ratio
	Bilingual	Control	
Second semester college (51 cases)	77.1	72.7	2.61
First semester college (89 cases)	73.5	71.1	1.74
Senior year high school* (101 cases)	2.61	2.35	2.82
Junior year high school (101 cases)	2.55	2.17	4.22
Sophomore year high school (101 cases)	2.56	2.25	3.61
Freshman year high school	2.67	2.42	2.84

*The high school grades are in terms of the "Honor points" previously described.

This is due to two factors: (a) the grades for the second semester of the Intensive Study Group were not available, and (b) some members of the Survey Group did not complete the second semester.

Since some of the high schools based their records on numerical and others on letter grades, it was necessary to record all grades in terms of letter grades. Then an arbitrary "honor point" system was used, giving four points for an "A" grade, three points for a "B" grade, two points for a "C" grade, and one point for those receiving "D." Due to this, and also because of the fact that the bilingual students came from 34 and the control students from 33 different high schools, great stress cannot be laid upon the results. It is obvious that many different standards of teaching, marking, and requirement have entered into the making of the grades finally recorded in the registrar's office.

In 59 cases there was a control student from the same high school as a bilingual student, but in almost none of these cases were they matched pairs. One or the other of the members of 72.2 per cent of the pairs came from the city school system which would not grant access to its records. The other

26.8 per cent of the pairs came from about 40 different high schools. In view of this fact and the small number of cases that would be left it did not seem worthwhile to try to trace the elementary school records of this latter group.

Table 8 shows that the difference in performance remained constant throughout high school and is consistent with the first year performance in college, showing that the bilingual students did significantly better work than their controls. The first semester of college does not show a clear difference, probably because of the new situation for all concerned.

In both groups it is of interest to note that the high school records showed that the freshman grades were highest, the senior grades second, with the sophomore grades coming next, and the junior year grades the lowest. Thus both groups show fluctuations throughout their high school career in the same manner. The smallest differences between the groups were found in the years in which they made their highest grades. Whether this means that both groups did their best possible work in their freshman and senior years (which might be true because of the new situation in the freshman year, and the incentive of graduation in the senior year), or whether it means that they were graded more leniently during these years (the faculty taking into consideration the previously mentioned factors), it is not possible to determine. If the first hypothesis should be true, one might hazard the theory that for those years both groups were working more in accordance with the limits of their capacity, which would be one possible explanation of the lessening of the difference between the groups. This tendency seems to be repeated during the first year in college.

On the other hand, one other tendency should be noted. If the senior year is disregarded, there is a consistent and steady lessening of the difference between the groups from the junior year down to the freshman year of high school. There is a possibility that this lessening of the difference might have continued had the elementary school grades been available. This might in turn suggest that, with growing maturity and its accompanying realization of the uniqueness of their position, ambition grew among the bilingual students. However, since grades for the elementary years were not available, and since the diversity of schools from which the groups are drawn to a certain extent nullifies any findings, this must remain an extremely tentative hypothesis. It is, however, a possible tendency which should be investigated with subjects from a more cooperative school system. In connection with this tendency it should be noted that the size of the critical ratios does not hold for the first year of college performance. It may be that this argues against the hypothesis, or it may be that in the junior year of high school the point

was reached where ambition added to ability reached its saturation point in resultant achievement, and that beyond that point the differences could not increase. A study of the differences throughout the whole college course would be of value and of interest, but was impossible with the present group because of the high rate of withdrawal. (At the beginning of the third year of the study only 18 of the 69 pairs originally in the Survey Group remained in college, withdrawals being about equal in the bilingual and control groups.)

VOCATIONAL PLANS OF BILINGUAL STUDENTS AND CONTROLS

In the Survey Group, where the bilingual and control students were not matched for socio-economic status, a slight but not significantly higher level of vocational choice was found for the bilingual students when that choice was rated according to the Edwards Scale. Very much the same finding came from a similar study of the Intensive Study Group. A comparison of the two groups can be seen in Table 9. The Survey Group, it must be recalled, was

TABLE 9
VOCATIONAL CHOICE OF BILINGUAL AND CONTROL STUDENTS

Occupational level (Edwards Scale)	The Survey Group			The Intensive Group		
	Bil.	Con.	C.R.	Bil.	Con.	C.R.
Professional	38%	48%	1.18	56.2%	43.7%	1.01
Managerial	13%	16%	.50	9.4%	6.2%	.49
Clerical	13%	23%	1.34	31.3%	34.6%	.28
Skilled	0%	0%		3.1%	12.4%	1.41
Semi-skilled	0%	0%		0 %	0 %	
Unskilled	0%	0%		0 %	0 %	
No choice	16%	13%	.50	0 %	3.1%	
Total	100%	100%		100%	100%	

not matched for socio-economic status, while in the Intensive Study Group the Barr Rating of Occupational Status (14) for the fathers of the bilingual students was 10.07, for the control students fathers 10.25, with a critical ratio of only .24.

All those in the Skilled classification for the Intensive Study Group are students planning to go into aviation. The difference in the per cent wanting to go into the Clerical level is ironed out by matching for socio-economic status, but the higher percentage (still not significant) of bilingual students planning on Professional occupations remains.

While these differences in occupational choice are not significant, they are consistent enough to warrant further investigation. Consequently the Strong *Vocational Interest Blank* (12) was used in order to check on the congruence

of interest expressed and interest as shown in the testing situation. The average level of occupational choice for the bilingual students on the Edwards Scale is 2.16, that of the control students 1.81, with a critical ratio of 1.40. Scored on the more discriminating Barr Scale this difference disappeared. The average Barr Rating of the bilingual students being 13.75, and that of the control students 13.67, with a critical ratio of only .17.

The first comparison made in order to check the congruence of interests was through a comparison of the number of "A," "B," and "C" ratings received in their chosen field by the students in each group. The results shown in Table 10 indicate that what differences there were favored the bilingual

TABLE 10
PER CENT OF STUDENTS MAKING "A," "B," OR "C" RATINGS IN THEIR CHOSEN VOCATION
ON THE STRONG VOCATIONAL INTEREST BLANK

Rating	Bilingual	Control	Critical ratio
A	56.3%	46.9%	.76
B	40.8%	43.7%	.25
C	3.1%	9.4%	1.05

students, but they are not important. Thus it would appear that the slight difference in vocational choice between the groups is based on interests which are actually possessed by the students.

In order to discover whether there were any differences between the groups in their average interests as tested by each of the scales the average scores for both men and women have been calculated on each scale for which the tests were scored. For the men the six group interest scales were used (Biological Sciences, Physical Sciences, Social Sciences, Business Detail, Business Contact, and Literary). For the women the scales used were those of Y.W.C.A. Secretary, Teacher of English, Physician, Stenographer-Secretary, and Nurse. The first three of these were chosen on the basis of the factor analyses of Crissey and Daniel (2) giving factors of Interest in People (Y.W.C.A.), Interest in Language (Teacher of English), and Interest in Science (Physician). These three factors are matched on the men's blanks respectively by the scales for the Social Sciences, Literary, and Biological Sciences. A factor was found for men (Thurstone, reported by Crissey and Daniel), of Business, but this was not found for women; the fourth factor for women was Male Association (not matched by any factor for men) which has a strong positive loading in the Nursing scale. The average scores in the various scales are tabulated in Table 11.

Of particular interest to us are the scores of the three factors which are

TABLE 11
AVERAGE STANDARD SCORES ON SCALES OF STRONG VOCATIONAL INTEREST BLANK

Scale	Bilingual	Control	Critical ratio
<i>Men</i>			
Biological sciences	33.3	35.3	.70
Physical sciences	30.3	30.9	.19
Social sciences	35.6	36.8	.51
Business detail	43.2	34.1	2.61
Business contact	41.5	41.9	.15
Literary	36.5	39.8	1.28
<i>Women</i>			
Y.W.C.A. secretary	24.4	17.9	1.22
Teacher of English	28.7	16.6	2.71
Physician	19.9	20.9	.21
Stenographer-secretary	41.0	50.1	1.79
Nurse	36.5	42.9	1.21

found in both the men's and women's scales. Interest in People was found to be not significantly different for the men (critical ratio .51), nor for the women although the critical ratio is higher (1.22). In the case of the men Interest in People is somewhat higher for the control students, with a reversal for women where the bilingual students have the higher interest. However, since neither difference is significant we shall not consider this further.

Interest in Language shows this same reversal, the control men and the bilingual women having the greater interest. For the men the difference is not significant (critical ratio 1.28), but for women it is (2.71). At this point it becomes important to consider the correlation found in the Survey Group between ability as measured by the Henmon-Nelson Test and English ability as measured by first year grades in English. For the bilingual the Pearson Product-Moment correlation was $+.450$, for the control women it was $+.474$, the critical ratio being only .12. Thus this significant difference in *interest* in language on the part of bilingual and control women is not reflected in a higher *ability* in language as tested by the relation between capacity and grades received. But it becomes of interest when one considers also the fact that for the men (where the difference in *interest* is not significant) there is a correlation of $+.511$ for the bilingual students between their Henmon-Nelson scores and their first year English average, and one of $+.692$ for the control men, the critical ratio being 1.72.

These facts suggest that perhaps the greater *interest* in language on the part of bilingual women serves as an incentive for performance in English, so they show an insignificant difference in performance when compared with the control women. The bilingual men, lacking this greater difference in

interest fall behind the control men in the extent to which their *ability* correlates with their performance.

This same sort of relation between mental ability and language achievement was found by the author in a previous study (9) where a correlation (for non-bilingual students) between mental ability as tested by the Henmon-Nelson Test, and ability in German as tested by first year grades in German was $+.629$ for women, and $+.125$ for men. The same type of difference was found by comparing the performance of men and women on the Coöperative German Test with their ability as measured by the Henmon-Nelson Test, the correlation for women being $+.338$, and for men $-.091$. It may be that here we have simply a sex difference in language interest, which is reflected either in a simple language learning task (a foreign language studied in college), or the more complex language learning situation of a bilingual environment. On the other hand it is possible that the greater interest in language shown by the women who are bilingual was due to a feeling of inadequacy, and thus it may be one indication of a source for the greater ambition of the bilingual students and may serve as one possible cause of their superior academic performance.

In regard to the third factor, an Interest in Science, neither of the groups showed any significant differences. The critical ratio for the men was $.19$, and for the women $.21$, in both cases the slight difference which existed favoring the control groups.

The Business factor, found only for the men's scales, shows a critical ratio of 2.61 favoring the bilingual group in Business Detail, but no difference as measured by the scale for Business Contact. This difference is not reflected in the occupations chosen by the bilingual students, where there is a critical ratio of only $.28$ on the Clerical level. This becomes important then as being the only instance in which the vocational choices expressed by the students do not seem to be comparable with their vocational interests as those are measured by the Strong Blank.

The single factor found for women, but not present in the men's scales, that of Male Association, showed a critical ratio of 1.21 favoring the control group. This may be an evidence of a slight rejection of Male Association (or even of repression perhaps due to failure to secure a sufficient amount of said attention and association), on the part of the bilingual women. If so its basis probably lies in feelings of inferiority, but this is speculative and not of importance without further evidence.

SUMMARY AND CONCLUSIONS

1. The Survey Group consisting of 69 freshmen at American International College who had been bilingual in childhood (24 women and 45 men) was matched on the basis of the Henmon-Nelson *Test of Mental Ability*, as well as for age and sex, with a control group. Critical ratios ranging from .16 to .48 in regard to the number of items attempted on the Henmon-Nelson Test and the number of items passed; and critical ratios between .01 and .16 in regard to the per cent of the final score made on each type of problem, demonstrated the validity of matching the bilingual students and their controls by means of this test. The Intensive Study Group, consisting of 32 freshmen at American International College who had also been bilingual in childhood, was matched on the basis of the Henmon-Nelson *Test of Mental Ability*, as well as for age, sex, and socio-economic status. The main part of this study is reported elsewhere, but two phases of it were considered here: the pre-college academic performance of the students and their vocational plans.

2. On an individual verbal test of intelligence (the Terman-Merrill Revision of the Stanford Binet Scale, Form L), the averages of the two groups did not differ significantly. Only one item in the scale, telling the difference between abstract words at the Average Adult Level, showed a significant difference between the groups. But of the six items showing a difference of more than 10 per cent, five involved verbal factors. These facts showed that a slight, although not significant, handicap of a verbal nature existed for the college level bilingual students. It was not, however, sufficient to affect significantly performance on a verbal test of intelligence.

3. Although none of the differences were significant, the bilingual students showed a consistent superiority in English ability (except for performance on the Binet scale). This was demonstrated by the higher average score on the Purdue Placement Test in English, a larger percentage of the bilingual students making scores in the upper 10 per cent according to the norms, and by higher grades in English courses during the freshman year.

4. The bilingual students in the Survey Group were not handicapped in reading ability, as was demonstrated by an almost identical performance on the Nelson-Denny Test by the two groups; and by the insignificant difference between their averages on the reading section of the Purdue Test.

5. The academic performance of the bilingual students in the Survey Group was not affected by the slight verbal handicap shown on the Binet, which was, of course, offset by their advantage in English achievement. In fact the bilingual students were found to do consistently better academic work throughout both semesters of their first college year.

6. The further investigation of the pre-college academic performance of the students in both the Survey and Intensive Study Groups revealed the fact that the difference in performance was a real one, significant at every level throughout the high school years, and that it favored the bilingual students. However, in view of the lessening of the difference with each year below the junior year in high school, it became increasingly possible to say that a compensatory drive arising from general insecurity, which was created by poor rapport with the environment, was a contributory cause in their difference in achievement.

7. There was a slight, but not significant, evidence of a higher level of vocational plans on the part of bilingual students. This was found consistently in both the Survey Group and the Intensive Study Group. However, the slightly higher vocational plans of the bilingual students were based for the most part on congruent interests as measured by the Strong scale.

8. There was some evidence from the difference (approaching significance) on measured interest in Business Detail that the bilingual students should have expressed more interest in this field.

9. The bilingual women (although not the bilingual men) had a significantly greater interest in language. This may reflect simply a sex difference, or it may be that the driving power coming from this greater interest explains why the bilingual women more nearly equalled the control women in performance as compared with ability than did the men.

Summarizing most briefly one might say that, it becomes clear at least at the college level, there are no continuing effects which stem from a bilingual childhood and which shows themselves in the academic records, vocational choices, or English ability, of bilingual students. Neither does bilinguality seem to have any significant effect on the performance of college age bilingual students on a verbal test of intelligence. If there were a bilingual handicap in childhood functioning in either academic or verbal adjustments it has certainly become stabilized by the first year of college.

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SHORT ARTICLES AND NOTES

The Journal of Genetic Psychology, 1944, **64**, 159-162.

THE SCORES ON THE REVISED MINNESOTA PAPER FORM-BOARD TEST AT DIFFERENT GRADE LEVELS OF A TECHNICAL-INDUSTRIAL HIGH SCHOOL*

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Because of the heavy concentration of large industries in Rochester, New York, with such companies as Eastman Kodak, Bausch & Lomb, Ritter, and Taylor Instrument, there has been a steadily growing demand for training in the technical skills. Trade training classes and technical schools in the city have grown rapidly, so rapidly in fact that the technical-industrial high school found it necessary in 1939 to establish objective criteria for the selection of the most capable pupils from the many who applied, because facilities were not available for the accommodation of all.

A testing program was, therefore, established for the selection of pupils. Since individual tests of mechanical abilities, such as the Minnesota Mechanical Abilities Tests, could not be used because of the limitations of time and personnel, a battery of group tests was used. The tests were: the MacQuarrie *Test of Mechanical Ability*,² The Revised Minnesota Paper Form-board Test (Series *AA*), and the Revised Alpha Intelligence Examination (Wells revision No. 7). An intelligence test was included, since academic subjects are, of course, part of the curriculum in a technical-industrial high school and verbal intelligence is known to have discriminating value for academic courses.

These tests were given to all of the 389 eighth grade pupils from

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¹The author wishes to express his appreciation to, the following persons in the Rochester Public Schools who made this study possible: Miss A. Leila Martin, Director of the Department of Child Study; Mr. Verne A. Bird, Assistant Superintendent of Schools; and, Mr. Howard S. Bennett, Principal, Edison Technical & Industrial High School.

²Revision by Likert and Quasha, sold by the Psychological Corporation in New York City.

of arithmetic was substituted.⁷ Kenneth Beach, in an extensive doctoral investigation,⁸ later corroborated the a priori judgment of the psychologist. Beach found that whereas the Minnesota Paper Formboard Test did not differentiate between good and poor shop pupils in the 10th and 11th grades, the test in the fundamentals of arithmetic yielded significant differences between failures and successes in shop.

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⁷This test has proven very useful in the selection of pupils for technical and industrial courses and for the selection of apprentices in industry. Although privately printed, the author will send sample copies to interested persons.

⁸*Prediction of Success in Shop Courses in a Technical and Industrial School* by Kenneth Beach. The thesis is available through the Library of the Graduate School of Cornell University, Ithaca, New York.

BOOKS

The *Journal of Genetic Psychology*, the *Journal of General Psychology*, and the *Journal of Social Psychology*, will buy competent reviews at not less than \$2 per printed page and not more than \$3 per printed page, but not more than \$15.00 for a single review.

Conditions. Only those books that are listed below in this section are eligible for such reviews. In general, any book so listed contains one or more of the following traits: (a) Makes an important theoretical contribution; (b) consists largely of original experimental research; (c) has a creative or revolutionary influence in some special field or the entire field of psychology; (d) presents important techniques.

The books are listed approximately in order of receipt, and cover a period of not more than three years. A reviewer must possess the Ph.D. degree or its equal in training and experience.

Procedure. If among the books listed below there is one that seems important to you, you are invited to write a review of that book. It is not necessary to make arrangements with the Editor. Just send in your review. It does not matter if the book in question has been reviewed before.

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CRITICAL REVIEWS OF RECENT BOOKS

The Journal of Genetic Psychology, 1944, 64, 165-169.

(Watson, G., et al. *Civilian Morale. Second Yearbook of the Society for the Psychological Study of Social Issues. Boston: Houghton Mifflin, 1942. Pp. 463.*)

REVIEWED BY HOWARD DAVIS SPOERL

This survey of the psychological problems of morale was ready for the press when the United States entered the war. Some manuscripts were revised, and material dating to March, 1942, found its way into the book. On the whole the lack of need for basic changes speaks well for the general adequacy of the enterprise as conceived and executed.

Twenty contributors furnish chapters on various phases of morale. These include theoretical studies of the psychological nature of morale, special topics like morale and leadership, propaganda, news; morale among students, Jews, Negroes, and in Canada; industrial and labor morale. A concluding chapter by G. Murphy provides comprehensive comments.

The divergence of interests and methods is strikingly balanced by the unified coördination of findings which the authors achieve. They comprise the view that civilian morale in this country is favorable, that there are known and workable methods of promoting it, and that psychologists have much to contribute to public needs. As G. Murphy confesses, however, the fate of their contribution in official quarters is subject to grave doubts. Social psychologists have begun their study of pressing problems on a high and practical level, but they are newcomers to the agencies that might utilize their recommendations. In the opening chapter, for instance, G. W. Allport describes 11 characteristics of good morale, citing such items as voluntary coöperation, respect for the person, broadness of view, tolerance, etc.—in the seemingly over-sanguine hope that his observations will count for something. Other contributors proceed in a similar spirit. But actual events and recent policies are often decidedly at variance with the liberal and psychologically sophisticated aim. More than once the book emphasizes the need for revealing to the public just what it has reason to expect and just what will be expected of it. This principle is flatly contradicted

by the flow of rumor, the announcement and revision of decisions in regard to rationing, civilian defense, selective service, etc., and by many kinds of uncertainty produced in a citizenry that is generally desirous of co-operating. This state of affairs, besides other considerations, urges a close scrutiny of the work for outstanding defects, that scientific psychology may be aided to secure the recognition it deserves and also a greater opportunity to be concretely effective. As a whole the book is well done, but it may be examined critically for shortcomings under three principal headings. These are: inadequate developmental insight, inadequate dynamic insight, and failure of scientific objectivity.

Although five chapters are devoted to the theme "How Morale Develops," with one shining exception they fail to come adequately to grips with the realities of longitudinal causation. Thus Lippitt's study of youth groups largely brushes aside the psychological genesis of youths' outlooks in terms of their personal pasts. Elsewhere a chapter on student morale charts shifts of student opinion in recent years in apparent disregard of the fact that at the college age everything depends, not upon what the previous college generation thought, but upon the successive effective influences in childhood. Clinical experience shows that the student's age when the depression hit his family, his year of birth, the coincidence of puberty with various external events, etc., are far more significant than thought-traditions in an institution of constantly changing personnel. Moreover, such phenomena as these are open to collective study at the college level, and their importance for our knowledge of morale is considerable. Whatever may be the outlook at present, if the war lasts for five years, new and different factors will have become operative upon the freshmen of that later period. Politicians sometimes make capital of illicitly static portrayals of given situations; such an error is inexcusable in a social scientist. L. B. Murphy's chapter "Children Are Important to Morale," on the other hand, not only avoids the shortcoming just mentioned, but makes it clear that the problem of maintaining morale is a perpetually changing problem, simply because people grow up.

As to the insufficiency in *dynamic* point of view, nearly the entire book offends to some extent in this respect. While, as might be expected, the various authors pay much attention to motivation in general, they seem to have almost no interest in the nature and meaning of *particular motives*, and their analyses of morale thus suffer from "face value" interpretations of superficial phenomena. This is outstandingly the case in D. Rugg's strategic chapter entitled "American Morale When the War Began," which

is a painstaking study of the results of opinion polls. When asked certain questions people will state what they *think* they think, want, or are willing to do. What is behind all this is organizations of dynamic forces within the personality, more or less beset by or free from unconscious conflict. Much depends upon the stability of these inner integrations, regardless of the firmness with which the frequently heterogeneous and symbolical declarations related to them are expressed. To one person, "all-out aid" may signify chiefly readiness to release a conflict based, say, on a sibling rivalry of long standing. To another, "approval of the President" may indicate basically the discovery of a socially approved outlet for fierce egocentric striving. *It makes a difference what is going on inside* if social actions and especially the use of human resources are predicated upon the otherwise uniform expressions of opinion about objective matters. One kind of motivation is reliable, another is not, and the knowledge that all people seem to be strongly motivated in a given direction is of little value unless the *nature* of the fundamental motives, and especially of conflicts between motives, are taken into account. One chapter, by K. B. Clark, on "Morale Among Negroes," displays an adequate grasp of what is called for, as does to a lesser degree that on "Morale and National Character" by Bateson. On a non-psychanalytical basis L. B. Murphy shows much appreciation of the complexity of the problem of inner dynamics, and of how to study it. Otherwise, there is something appallingly shallow about the book's easy whitewashing of national morale in terms of opinion polls alone!

The charge of lack of objectivity is a serious one, and yet it seems clear as much from topics avoided as from those included that several conclusions (again excepting the Murphys, Clark, and Watson) are helped along by wishful thinking on their authors' part. Morale is repeatedly defined in terms of *conscious ideation* rather than basic inner dynamics. Since the *thoughts* of people have undergone steady change in a given direction, it is tempting to suppose that their present preoccupations and future actions conform to the trend, and that *therefore* success to the cause is assured. The chapter on opinion polls is perhaps the worst offender. Many of the specific questions asked had their own internal propaganda value, a fact that Rugg admits in one place. Most of the actual responses are not inconsistent with attitudes and readinesses running decidedly against the public interest. The interpretation of poll results, however, is such as to suggest a far greater degree of *dependable* solidarity in the total population than probably exists. Incidental material in other chapters supports this doubt. For in-

stance, Clark seems to show satisfactorily that Negro morale is extremely low; and there are nearly thirteen million Negroes in the United States!

Again, it seems strange that psychologists, of all people, should accept at face value as something natural and trustworthy any marked collective about-face in attitude. Of what value are the laws of habit-formation and personality development, if sudden shifts of ideological wind are to be accepted as sure signs of reorganization of readiness to action? This observation incidentally suggests one very important omission from the book, namely, some study of religious institutions in present-day society, which in many cases demonstrate the effects of integration around moral principles as opposed to opportunistic headline-chasing.

An even more ominous sign of wishful thinking is the regular avoidance (except by L. B. Murphy and one or two others) of recognition that at best, *participation in warfare is in itself a psychologically disintegrative enterprise*. Doubtless faulty integration, maintained as a personality conflict, is pre-existent in most individual instances, as one would expect in a competitive social order; while this condition need not be disastrous to war effort, since aggressive action releases tension, *it must fearfully complicate the peace effort* to follow—unless further magical “about-faces” are to be believed in. It is the social duty of the psychologist to seek to determine the extent to which populations can go on living essentially maladjusted lives, even though “everybody’s doing it.” Apart from the implication of pre-existing inner conflict, there is the tremendous question of the production of future disintegration in contemporary children, particularly as the war effort, always adult-value-centered, subjects them to increasing degrees of neglect, insecurity, and rejection. Mrs. Murphy offers excellent recommendations for averting such catastrophes. But inasmuch as these would be accepted reluctantly if at all by a nation that simply doesn’t know how to rear children properly in peace time, the probability of their effectiveness when guns must come before butter is negligible. Her chapter shows clearly the extent to which we are in danger of producing a future population that could with difficulty administer *any* responsible social system, let alone a democratic one!

A further defect of the book is the unrealistic way in which plans are projected for the maintenance of coöperative social life by enlisting the resources of the population, without regard for the fact that the functioning population is beginning to suffer scattering and liquidation through combat and other casualties. Morale *could* be maintained at an unbelievably high level, and the population *could* put itself on the map democratically as

never before, in accordance with the psychological principles and demonstrations, *if it were not for the awkward business of killing, destruction, debasement of taste, economic waste, ethical deterioration, delinquency, malnutrition, familial disruption, etc., attendant upon the prosecution of war.* Any attempt to deal with morale that does not adequately take all this into account in advance comes dangerously close to being mere academic ivory-towerism.

Finally it is a disservice to the public to produce a study of morale which in its definitions and techniques assumes an Allied victory. On the supposition that this should not come to pass, will there not still be a place for morale? People will go on living—somehow; collective life will not cease. Perhaps journalists can be pardoned for not facing such a contingency; social *scientists* who must do the best they can by the facts they have, cannot afford miscalculations of this order. Again it may be said that the Murphys and Clark show awareness of the problem. It is refreshing that two authors quote part of an older and highly inclusive definition of morale once offered by G. Stanley Hall, informing us that morale exists “when we face reality gladly . . . even if it is grim and painful, and never doubt . . . that even if we are defeated and overwhelmed in a good cause all is not lost.” The *S.P.S.S.I.* should consider this aspect of the matter in future publications, just as it should relate the psychological problems of the war less to a purely ideological conflict of democracy and dictatorship, and (with Watson) recognize that people fight ultimately within frameworks of *economic competition*.

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(There will always be two pages of book titles, listed in the order of receipt, i.e., the most recently received books will be found at the end of the list.)

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and Comparative Psychology

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SOLUTION BY RHESUS MONKEYS OF PROBLEMS INVOLVING SECOND ORDER SIGN BEHAVIOR WITH INTER-MODAL CUES*

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THEODORE SPAET**

A. INTRODUCTION

The purpose of this investigation was to study the behavior of rhesus monkeys presented with a problem in which initial reaction to a pair of differential auditory stimuli determines final response to a pair of differential visual stimuli. Situations of this type in which one variable determines the response to a second variable have been defined by Lashley (13, p. 174) as "generalizations of a second order." Spaet and Harlow (18) have suggested the term "second order sign behavior" to describe situations of this type in which generalization is not demonstrated. Solution of problems involving such behavior has been reported by Rose (17) on the rat; by Robinson (16), Bromer (1), Weinstein (19), and Harlow (5), on the monkey; and by Kohts (11), and Nissen and McCulloch (14), on the chimpanzee. In all these studies, with the possible exception of that by Rose, the primary and secondary¹ variables have been in the same sense modality, namely, that of vision. In the present study the primary and secondary variables are in different sense modalities.

The general approach used in the present experiment has many points of similarity to that described by Weinstein (19) in his first matching-from-sample test. Both studies can be considered as matching-from-sign problems in which one of the stimuli constituting the primary variable is first presented. Only on the basis of this differential cue can the subject respond

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¹The classification of order of variables used here is in terms of temporal sequence. The primary variable is defined as the variable to which a differential response is first made. The secondary variable then becomes those stimuli to which a subsequent and dependent differential response is made. In the matching-from-sign problems (5, 19, 20), the primary and secondary variables can be clearly described; whereas in problems of the oddity type (1, 16, 18), it is impossible to differentiate between the two.

appropriately to the choice situation. In the present experiment it is a particular sound which indicates the correctness of a given choice-object; in matching-from-sample the nature of the sample-object determines the choice-object to which response must be made. The position and the nature of the correct choice-object is reversed from trial to trial in both studies.

B. PERTINENT LITERATURE

Though few studies have been reported in which auditory problems are presented to sub-human primates, the data which have been obtained indicate that these animals have auditory capacities similar to those of man and that they can utilize auditory cues in solving problems. Studies by Wendt (21) on the monkey and by Elder (2) on the chimpanzee show that the auditory acuity of these animals is quite similar to that of man.

Two studies have been reported in which auditory discriminations have been learned by monkeys. Woodrow (22) taught rhesus monkeys to discriminate between pairs of tap series differing only in the number of equally spaced taps. The best performance obtained was discrimination between four vs. five taps. Klüver (10) effected auditory discriminations in Java monkeys using bells, buzzers, and horns as sources of stimuli. The data indicated a high degree of transfer from one discrimination pair to successive pairs.

C. SUBJECTS AND APPARATUS

1. *Subjects*

The subjects were a pair of rhesus monkeys, Nos. 64 and 65, about four years of age. These animals had received extensive taming, and had been thoroughly adapted to the experimental situation before any tests were carried out. They had both been trained on a series of discrimination and discrimination reversal problems (6) prior to the beginning of the present study.

2. *Apparatus*

All testing was done in a cage like the one described by Harlow and Bromer (7) except for two essential modifications: the one-way vision screen was held in a hinged door instead of in a sliding panel; and the test tray remained in a constant position during any day's test period, as contrasted to the moving test tray previously described.

The stimulus-objects were a green, wooden *T*, 2¾" in height, nailed upright on a square base 2" x 2"; and a brass push button 2½" in diameter

similar to the kind used for doorbells. The bases of both objects were lined with felt to permit noiseless placement.

The stimulus-objects were presented on a test tray of unpainted wood, 8" x 24," containing two food wells 1" in diameter. The food wells were 15" apart center to center and were 3" from the front of the tray.

Two sound sources were used: a doorbell, and a buzzer. The doorbell was the louder, and the higher in pitch of the two. Determination of the sound to be produced was effected by means of a four-pole, double throw-switch; and a doorbell push button was the means of making the circuit. A single dry cell battery served as the source of current for both sound sources.

D. PROCEDURE

1. *General Test Procedures*

In the following problem, the subjects were trained to displace the green *T* upon presentation of a series of short sounds from the buzzer, and to displace the brass push button following one long sound from the doorbell. A trial was run in the following manner: with the forward screen down, a small piece of orange was placed under one of the stimulus objects. The appropriate auditory stimulus was then given, the forward screen raised, and the subject allowed to make a choice. If the response was correct, the subject immediately received the food reward. If the response was incorrect, the subject received no food, but the correct object was lifted by the experimenter and the associated sound again presented. The forward screen was then lowered, and repeated presentation of the same stimulus situation given in the manner described above until a correct response was made. Thus, a trial as described here is not completed until the food reward is obtained. Using this method, a constant number of food rewards is obtained each day, though a variable number of responses in which the stimulus-object is displaced may be made. This training technique is similar to that used by Krechvsky (12), and differs from that designated by Hull and Spence (8) as the "correction method," since repetitive errors can be made on a single trial.

Twenty-five trials were run each day. The order of presentation of trials was so arranged that each position and each object was correct an equal number of trials in a two-day run, and the frequency of either differed by not more than one trial in any given day. The order of presentation of

correct object and correct position was in random² and predetermined order with no object being correct for more than three successive trials, and no position being correct more than four trials in succession. Four different series were presented in order, each covering a day's trials.

The criterion for solution of the problem was not less than 80 errorless trials in the 100 successive trials constituting a four-day run.

Upon attainment of the criterial score, control trials were run in which the one-way vision screen was introduced between the subject and the experimenter. These trials were run as described above, save for the fact that the experimenter was always hidden from the subject, and the stimulus-objects were always placed on the tray in the same positional order; the leftmost object first, the rightmost object last.

2. *Preliminary Procedures*

Prior to the beginning of the experiment proper, 100 trials were run to accustom the subjects further to the stimuli and the test situation. In these trials the forward screen was never lowered. Food was placed under one of the stimulus-objects and the appropriate sound simultaneously presented. The monkey was then allowed to make a choice, and a trial completed in the manner described above. This method has been described by Weinstein (20) as a tutoring procedure.

3. *Adaptations of the General Test Procedures*

Several alterations in the experimental procedure were made in the course of training. Originally a single presentation of the sounds was given (two half-second buzzes, or one two-second ring), and the forward screen was not raised until the sounds had ceased. Consequently, a short period of delay occurred between introduction of the primary and secondary variables. After 1000 trials had been run, presentation of the sounds was continued until the subject had displaced a stimulus-object. At this time, the technique of raising the forward screen slowly (total time about two seconds) was instituted to prevent the animals from immediately displacing the nearest stimulus-object.

After 800 trials had been run, it was discovered that the trial-order series in use allowed a score significantly beyond chance if the subjects responded on the basis of simple positional alternation. A new series was then intro-

²As used here, a random order series is so constructed that solution by serial cues is not possible. The term is not used in its strictly statistical sense.

duced which eliminated such a possibility. After introduction of the new series, use of a negative incentive, a sharp "no!" from the experimenter was made whenever an incorrect stimulus object was displaced. This procedure resulted in hesitation by both subjects before making a choice. On occasions when the negative incentive appeared to disturb the subjects, it was omitted for the following few trials. The negative incentive was not administered during the control trials when the one-way vision screen was used. The verbal "no!" as a means of producing inhibition of response has been successfully used by Woodrow (22) in tap series discrimination, and by Weinstein (20) in a color categorizing problem.

E. RESULTS

The problem of second order sign behavior involving two sense modalities was solved by Animal 64 in 2300 trials, and by Animal 65 in 2000 trials. These data are presented graphically in Figures 1a and 1b. After introduction of the one-way vision screen, Animal 65 again attained a criterial score in 200 trials. Animal 64, on the other hand, adapted to this innovation quite slowly, though her score was significantly beyond chance³ after the first 100 trials.

For both subjects, the learning curve may be divided into two stages: (a) those trials in which a brief delay was interposed between the auditory and the visual stimuli, and (b) those trials in which the auditory and visual stimuli were presented simultaneously. The learning curve for Stage (b) is an S-shaped learning curve if considered by itself, and it is quite consistent for the two subjects. In both cases there is a rapid initial rise from a chance score, a long plateau with a score close to the three *SD* beyond chance line, then another rapid rise to solution.

The learning curves of the two subjects differ markedly for Stage (a). Animal 65 showed little evidence of learning during this time. Learning had definitely taken place in the case of Animal 64; but what was learned was not the problem as outlined. The animal had learned to do simple positional alternation. The series in use was so constructed that such a behavior pattern could result in a score as high as 70 per cent in any 100 consecutive trials. Introduction of a new series in which alternation would result in a

³All calculations of statistical significance were made using the formula,

$$\sigma_p = \frac{\sqrt{p(100-p)}}{n}$$
 where p = the theoretical chance per cent. A score of 3 sigma or more above chance was taken as significant.

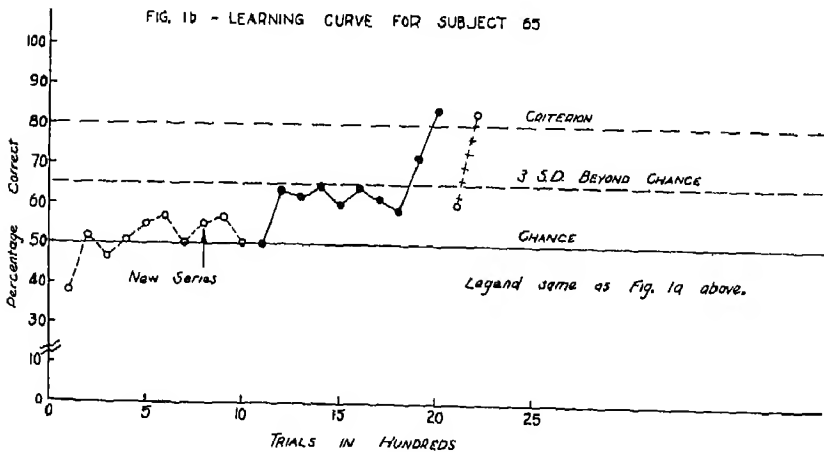
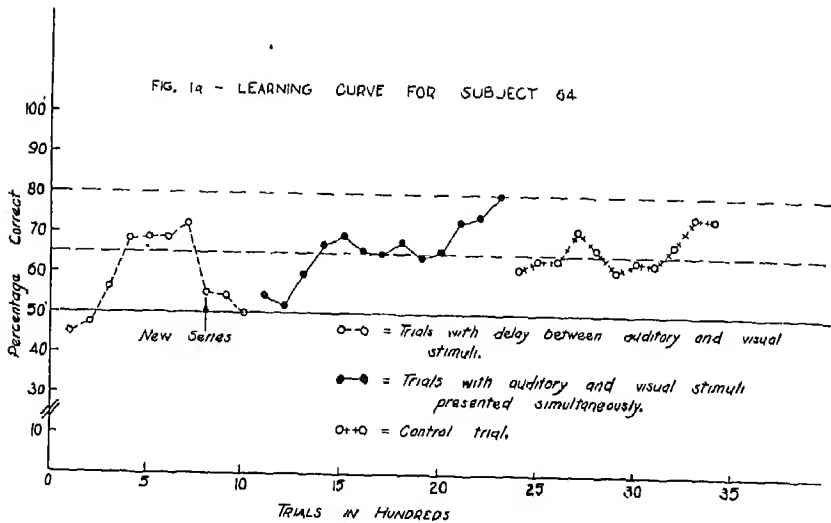


FIGURE 1

chance score, dropped the animal's performance to the chance level. The learning curves of alternation by Animal 64 are presented in Figure 2. The curves show that the animal maintained a tendency to alternate through final solution of the problem even though such behavior later occasioned as many errors as correct responses. Animal 65 developed no clear-cut alternation pattern.

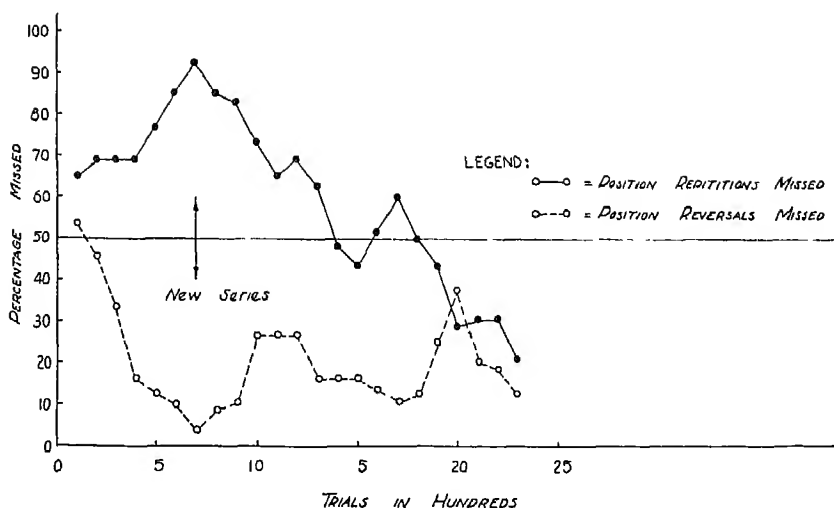


FIGURE 2
LEARNING CURVE OF ALTERATION BY ANIMAL 64

F. DISCUSSION

As has already been pointed out, the present investigation belongs to the general class of problems involving a second order sign behavior; and it is most closely related to the matching-from-sign problems, as exemplified by the work of Kohts (11), Weinstein (19, 20), and Rose (17). Since similarities have already been described, emphasis need be given to only certain salient differences.

In the matching-from-sample situation, the primary and secondary variables are identical, and are therefore complete sensory equivalents. Such equivalence might be considered as constituting the simplest possible matching situation, involving what Revesz (15, p. 338) has called mere "ability to cognize on a sensory plane." In problems such as ours, where the primary and secondary variables are in different sense modalities, there is no reason to believe that any preferential relationship exists between either of the stimuli comprising the primary variable and either of the stimuli of the secondary variables. Variations and inadequacies of the techniques in the reported investigations make it impossible to determine directly whether or not there is any relationship between problem difficulty and degree of sensory equivalence between primary and secondary variables.

Another difference lies in the nature of the response to the primary varia-

ble. In the matching-from-sample situation, the subject is first trained to orient to the sample-object; and response to it is rewarded. In the present study, the animal receives the primary sign (auditory stimulus) regardless of bodily orientation or cage position. Furthermore, he makes no overt spatial response to the primary sign, and receives no reward from it. The tendency toward a position stereotype, which develops in the matching situation, is consequently eliminated at the outset, since the auditory variable is by its nature "locus free," as this term is used by Weinstein (20). Again, the effect of these factors upon the rate of learning has not been measured.

Studies, such as those reported by Hunter (9) and Girden (3) bear a certain superficial resemblance to the present investigation. In all these cases, two auditory stimuli are presented, each eliciting a different response. The former two studies cannot be classified as problems involving second order sign behavior, since *each of the stimuli constituting the auditory variable is always associated with a single response pattern*. Thus, clapping always elicits a right turning response in the T maze, whereas silence produces turning to the left (9). A buzzer at the right causes flexion of the leg; a buzzer at the left elicits no response (3). In experiments of this type, there is a constant relationship between a particular stimulus and a particular effector pattern. There is no such simple stimulus-response relationship in problems involving true second order sign behavior. *Either stimulus of the primary variable (as bell or buzzer) may elicit either of the two effector patterns*, namely, response to the object in the left or the right board position, depending upon the secondary variable, the nature (or object quality) of the choice stimulus-objects.

The data obtained in the present study offer a contribution to the multi-factor interpretation of learning proposed by Spaet and Harlow (18). According to such an interpretation, learning involves the subordination of one or more incorrect response tendencies, and the resulting emergence of the correct response tendency to a position of dominance. Response in any particular trial is governed by a number of competing response tendencies which may or may not be antagonistic. Consequently, incorrect response tendencies may lead to correct responses. Such ambiguous reinforcement of any particular response increases the complexity of problems containing several variables by decreasing the frequency with which a particular sign is differentially reinforced in relation to all other signs.

The establishment of the incorrect response tendency of positional alternation by Animal 64, and its subsequent subordination are in keeping with the multi-factor interpretation of learning. When this animal was responding to

the primary cues of the problem, as described, with a frequency significantly better than chance, the animal was clearly demonstrating a tendency to alternate. Comparison of Figure 1a with Figure 2 shows that at the long plateau from Trials 1400 to 2000 a score of about three *SD*'s beyond chance was accompanied by consistent alternation. After 2000, when the alternation tendency had been quite effectively subordinated, a rapid rise occurred in the number of correct responses, and solution of the problem soon followed. The persistence of the alternation tendency through the end of the problem may be explained on the basis of ambiguous reinforcement, since a balanced series of the type used necessitates frequent reinforcement of alternation behavior.

G. SUMMARY AND CONCLUSIONS

1. Two rhesus monkeys were trained to respond to a green *T* regardless of position, upon presentation of short sounds from a buzzer, and to respond likewise to a brass push button after a long sound from a bell.
2. Both subjects attained an accuracy of performance of at least 80 per cent correct responses in 100 consecutive trials within 2300 training trials.
3. The data obtained present evidence for a multi-factor interpretation of learning emphasizing the subordination of incorrect response tendencies.

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MECHANISMS OF EARLY INFANT FEEDING*

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A. INTRODUCTION

The problem in the present investigation is to determine how sucking, swallowing, and breathing are carried on during infant feeding.

Previous investigations (2, 3, 10, 11) show that sucking and breathing are carried on simultaneously. The two activities may be combined rhythmically, or they may be temporally independent. Peiper's studies (10, 11) indicate that strong sucking movements retard breathing and force their rhythm on the breathing rhythm, but that weak sucking may have little effect on respiration. He states that breathing movements are small during strong sucking and that when both activities are regular the infant sucks either once or twice during each respiration. Ribble (12) asserts that inspiration during feeding becomes deeper and more regular with age. Balliassnikowa and Model (2) report that the uneven breathing of the neonate becomes regular during sucking but is interrupted by sighing. Eckstein (cited by Peiper, 10) says that in premature infants breathing becomes shallow during strong sucking. Basch's curves (3) reveal no close temporal relationship between sucking and breathing.

Available data (2, 3, 5, 10, 11) indicate that when there is a difference in speed between the two activities, the sucking rate is generally higher than the breathing rate. These data show 44-112 sucking movements and 30-67 breathing movements per minute under normal feeding conditions. Peiper reports (11) that healthy infants make from 60 to 96 sucks per minute.

The ease with which infants carry on feeding and breathing activities and the absence of well-marked pauses in the breathing curves have led some investigators to believe that swallowing, as well as sucking, occurs simultaneously with breathing. Vallois and Fleig (14), for example, assert that infants can swallow and breathe at the same time. Czerny (cited by Peiper, 10) says that in infants the anatomical relationship between the parts involved in swallowing and breathing is such that two activities may function simultaneously. Peiper (10) states that breathing can occur without interruption

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during swallowing, provided the milk is propelled through the pharynx at a favorable phase of breathing. In support of this view he points to (a) the speed with which the food is shot into the esophagus, (b) the short neck of the infant, and (c) the tendency of the Adam's apple to rise with each suck (and swallow) and thus block the laryngeal aperture. On the other hand, Vierordt (cited by Pieper, 10) asserts that infants, like adults, must bring breathing to a stop when swallowing occurs. Basch (3), in attempting to prove the truth of this assertion, found short pauses at certain intervals in the breathing curve, which, in his opinion, indicated that breathing was interrupted during the act of swallowing. Clark (4) has demonstrated that adults require a relatively long breathing pause for a swallow of liquid food. However, pauses of such duration do not occur during infant feeding.

The frequency of swallowing apparently depends on the amount of milk obtained per suck. Susswein (13) and other investigators (see Peiper, 10) noted during breast feeding that at the beginning of the meal each suck was accompanied by a swallow and that late in the meal there were several sucking movements per swallow. In bottle feeding, there were either one or two sucks per swallow when the milk flowed evenly (13). Kashara (9) and Jensen (8) found that each suck was typically followed by a swallow and that only on rare occasions were there two sucks per swallow. Peiper (10) discovered when infants sucked once per respiration each suck was followed by a swallow and when they sucked twice per respiration there were either one or two swallows per respiration.

Swallowing is generally regarded as a continuation of the sucking movement (2, 10). Baliassnikowa and Model (2), for example, assert that swallowing is the last link in a chain of motor phenomena accompanying sucking. Examination of the regular sucking curves obtained by Kashara (9) and Jensen (8) reveals that swallowing occurs immediately at the end of the sucking movement. Peiper (10) obtained X-ray views of the movements of the milk in swallowing and then related these movements to the kymographically recorded sucking and breathing movements. He found, as did Basch (3) and Pfaundler (cited by Peiper, 10) that the milk entered the mouth while the lower jaw was being elevated after the suck. Frequently the milk was propelled immediately into the esophagus. Thus each complete sucking movement carried with it an oral-phalangeal swallowing movement. At times the milk collected in the mouth during two or three sucks before swallowing occurred.

The evidence (10, 11) appears to indicate that either weak sucks have no

effect on breathing or the effect is such as to escape notice. Since strong sucking has a very profound effect on breathing (11), it would seem that if an infant who is sucking weakly should gradually increase the power of his sucks, a point would be reached at which their effect on breathing can be observed. If the sucking power is further increased the effect would then become more marked and eventually be that of strong sucking. Furthermore, since sucking is a relatively stereotyped response, whenever the sucks impress themselves on the breathing curves, the form of the impressions should be basically the same despite alterations in the power and duration of the sucks. Careful matching of simultaneous sucking and breathing curves may reveal the exact nature of the impressions.

Perhaps the most difficult part of the present problem is that of determining when swallowing occurs with reference to sucking and breathing. Because of the uncertainty as to the time of transit of the milk through the pharynx during the experiment, investigators have failed to indicate on the breathing curve the points at which swallowing takes place. If, by some means, the exact location of these points can be determined, we shall have made great progress toward the solution of the problem. A method similar to that employed by Peiper would suffice, provided the data on swallowing is obtained simultaneously with the kymographic record. Furthermore, since the pharynx is the common passageway for the food and the air, one might expect that the act of swallowing, whether it occurs simultaneously with breathing or during a pause, would to some extent impress itself on the curve.

Since modifications in respiration have been noted during feeding (2, 5, 10, 11, 12) and both chest and abdomen participate in the breathing activity, it seems advisable to record the movements of the chest as well as those of the abdomen.

In view of the procedure followed in conducting the investigation, alterations in the sucking activity and probably in the swallowing and breathing activities may be expected during the feeding period as a result of fatigue, drowsiness, and changes in the state of hunger and in the supply of food. Alterations may also be expected from age to age due to the change from breast to bottle feeding, the use of different bottle nipples, and improvement in the power and mechanics of sucking.

B. APPARATUS

Sucking movements and costal and abdominal respiratory movements were recorded kymographically. The apparatus for registering sucking move-

ments consisted of a small rubber capsule $2 \frac{5}{8}$ inches long and $\frac{3}{8}$ inch in diameter, placed under the chin close to the Adam's apple and held in place by a narrow, easy-yielding rubber band encircling the neck. Respiratory movements of the chest and abdomen were recorded by means of two light and sensitive pneumographs described in an earlier experiment (6). The rubber capsule and the pneumographs each communicated with a recording tambour by a light rubber tubing of $\frac{3}{16}$ inch inside diameter. A glass *T*-tube, midway of the tubing, permitted inflation of the capsule and of the balloons of the pneumograph as desired. The costal pneumograph encircled the trunk at the level of the nipples; the abdominal pneumograph passed immediately over the umbilicus. Expansion of chest and abdomen deflated the balloons and caused the recording tambours to describe an up-stroke on the kymograph paper. Contraction of chest and abdomen was represented by a down-stroke. Similarly, depressing the lower jaw (the sucking movement) produced an up-stroke on the sucking curve, and elevating the jaw a down-stroke. An extension kymograph carrying a paper 10 inches wide, a time marker, and a signal marker, completed the apparatus.

A stethoscope, the bell of which was applied laterally against the neck and as far forward as possible without interfering with the movements of the lower jaw, was used to observe the sound of the milk in transit through the pharynx.

The apparatus employed in a previous experiment (5) was used in conjunction with the present apparatus for one minute in each of the first three feeding situations in order to determine the subject's usual power of sucking and the differential effects on breathing of changes in sucking power.

C. PROCEDURE

It was planned to conduct the experiment on each subject at the following ages: Birth, 3 days, and at 1, 2, 3, 5, 8, 13, and 18 weeks. No records were taken when the subject's condition made experimentation inadvisable. Two subjects (*G* and *S*) were not available after eight weeks.

The subject was first undressed, and after being covered with a blanket, was carried to the nearby experimental room, the temperature of which was about 85°F. With infants over two weeks of age the mother was seated on a low comfortable chair and the subject placed on her lap. The apparatus was attached and a dry diaper spread out loosely beneath the subject. The mother, upon being given a signal, leaned forward and presented her breast. When, after about two minutes of feeding, the subject had settled down to steady sucking, a 60-second record was taken of sucking and

breathing. Additional records followed at one-minute intervals until five samples of feeding were obtained. This procedure was also used for subjects when they fed from the bottle. Mothers whose babies were two weeks of age or less were wheeled to the experimental room on a hospital stretcher. The baby was placed on the stretcher beside the mother who, by lying on her side, could lean over and present her breast to the baby. The subjects were maintained in the supine position throughout the experiment. The breast was presented without moving the subject and the mother was cautioned to hold her position steady during each record.

While the records were being taken the two experimenters in turn made stethoscopic observations of the swallowing sounds and, by relating these sounds to the records, determined the position of the swallows with reference to the sucks and to the respiratory cycles. In this way data were obtained concerning the position of the lower jaw and the nature of the movements of the chest and the abdomen during the act of swallowing.

D. METHOD OF STUDYING THE KYMOGRAPHIC RECORDS

The temporal relationship between sucking and breathing was determined by means of a paper straight-edge. The position and duration of each suck of a series was carefully plotted on the straight-edge with reference to its distance from the start and end of the record. The straight-edge was then applied in turn to the costal and abdominal curves in order to determine at what phase of the respiratory cycle the suck occurred. The straight-edge was similarly used to determine the type of breathing, the form and regularity of the breathing cycles, and the direction of the costal and abdominal movements at corresponding points in the curves. Data were also obtained pertaining to breathing rates, sucking rates amplitude of the costal and abdominal movements, expiratory position of chest and abdomen, duration of the individual sucks, their regularity or irregularity, time elapsing between sucks, sucking rhythms, and suck-respiration patterns. The data were derived chiefly from the one of the five records at each feeding in which the sucking and breathing movements were most uniform. The remaining records were used to obtain additional data on suck-respiration patterns.

E. SUBJECTS

The subjects were 14 infants, 5 boys and 9 girls (see Table 1). Their birth weights ranged from 6.4 to 9.1 lbs. for the boys and from 6.1 to 9.4 lbs. for the girls. The average weight was 7.7 lbs. for the boys and 7.6

TABLE I
SIX-SWALLOW-BEHAVIOR PATTERNS FORMED BY THE INDIVIDUAL SUBJECTS AT EACH AGE LEVEL

Subjects	Sex	0				1				2				3				4				5				6				7				8				9				10				11				12				13				14				15				16				17				18				19				20				21				22				23				24				25				26				27				28				29				30				31				32				33				34				35				36				37				38				39				40				41				42				43				44				45				46				47				48				49				50				51				52				53				54				55				56				57				58				59				60				61				62				63				64				65				66				67				68				69				70				71				72				73				74				75				76				77				78				79				80				81				82				83				84				85				86				87				88				89				90				91				92				93				94				95				96				97				98				99				100				101				102				103				104				105				106				107				108				109				110				111				112				113				114				115				116				117				118				119				120				121				122				123				124				125				126				127				128				129				130				131				132				133				134				135				136				137				138				139				140				141				142				143				144				145				146				147				148				149				150				151				152				153				154				155				156				157				158				159				160				161				162				163				164				165				166				167				168				169				170				171				172				173				174				175				176				177				178				179				180				181				182				183				184				185				186				187				188				189				190				191				192				193				194				195				196				197				198				199				200				201				202				203				204				205				206				207				208				209				210				211				212				213				214				215				216				217				218				219				220				221				222				223				224				225				226				227				228				229				230				231				232				233				234				235				236				237				238				239				240				241				242				243				244				245				246				247				248				249				250				251				252				253				254				255				256				257				258				259				260				261				262				263				264				265				266				267				268				269				270				271				272				273				274				275				276				277				278				279				280				281				282				283				284				285				286				287				288				289				290				291				292	
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lbs. for the girls. All of the subjects were in good physical condition at birth. Their ages at the time of the first feeding record were: *G* and *O*, 8 hours (first feeding experience); *M* 1 day; *F*, *PL*, *S*, and *T*, 2 days; *K*, 3 days; *HA*, *HE*, *PA*, *R* and *WA*, 1 week; and *WO*, 2 weeks. In conducting this investigation frequent use was made of the terms *good feeder* and *poor feeder*. The term, good feeder, refers to a subject who showed good coördination between sucking, swallowing, and breathing, rather than to one who showed the usual gain in weight. A baby who failed to coördinate yet gained weight rapidly would not qualify as a good feeder. The term, poor feeder, refers to a subject who consistently failed to coördinate the three activities.

On the basis of their performances the subjects were divided into five groups: (a) *F*, *G*, and *K*, who exhibited well-coördinated sucking and breathing at all feedings; (b) *T* and *WO*, whose usually good coördination was interrupted by brief intervals of disorganization; (c) *HA*, *M*, *PA*, *R*, and *S*, whose sucking and breathing were for the most part coördinated; (d) *O* and *PL*, who usually showed coördination for only short intervals and (e) *HE* and *WA*, who usually failed to evidence any coördination.

F. RESULTS AND DISCUSSION

1. *Effects of Sucking on Breathing*

An earlier study of breathing curves of infants shows that respiration varies markedly with changes in behavior (6). Hence it is to be expected that breathing curves during feeding will display certain distinguishing features. These features can best be demonstrated by comparing the respiratory curves of coördinated sucking and breathing with those of profound sleep. Sleeping curves are used as a basis of comparison because they are approximated in regularity by the curves of coördinated sucking and breathing.

In profound sleep, breathing is quiet, smooth, and abdominal in type (6). The abdominal movements exceed the costal movements in amplitude. Inspiration is faster than expiration. The abdominal inspiratory movement is relatively rapid, whereas the costal inspiratory movement is relatively slow. Expiration is passive and is usually followed by an appreciable pause.

Analysis of the present kymographic records revealed that during feeding the chest and abdomen functioned not only in breathing but also in reinforcement of the sucking movements, the chest by expanding and stiffening, the abdomen by contracting and stiffening. Hence at whatever phase of the breathing cycle a sufficiently strong suck occurred the costal curve

showed an upward or horizontal trend and the abdominal curve a downward or horizontal trend.

The probability that the chest and abdomen function in infant sucking has been generally overlooked. The prevailing opinion appears to be that held by Auerbach (1) who asserts that the lower jaw plays the main rôle in sucking for the first four or five months and that the chest is the principal mechanism in adult sucking.

Chest expansion and abdominal contraction occurred with each suck, except in instances of very weak sucking, and varied in extent with the sucking power. Stiffening was associated with strong sucking and occurred after chest expansion and abdominal contraction. The latter movements occurred simultaneously with the increase in the power of the suck when the power was applied relatively slowly and anticipated the suck when the suck attained its full strength quickly. Thus, it was not unusual to find the chest and abdomen moving in opposite directions before the suck actually occurred.

Since sucking for the most part occurred either during inspiration, or during the pause after inspiration, or both, the effect on breathing of these suck-reinforcing movements was an increase in the amplitude of the costal movements and a decrease in the amplitude of the abdominal movements. As a result, breathing tended to become costal in type. Since the power of the suck-reinforcing movements varied directly with the sucking power, as the sucking power increased the costal movements became larger. The abdominal movements became smaller until finally a point was reached at which the suck-reinforcing movements were stronger than the breathing movements and completely inhibited them.

The optimal conditions for a strong suck were a well-inflated chest and a strongly depressed abdomen. The suck-reinforcing movements predominated over the breathing movements. There was a marked increase in the amplitude of the costal movements. The chest expanded sharply during inspiration and, after stiffening for the suck, quickly collapsed, expelling the air from the lungs with considerable force. The suck-reinforcing movements of the abdomen were so strong that they overpowered its breathing movements and created a paradoxical situation in which the abdomen contracted strongly during inspiration and expanded (relaxed) during expiration. These movements were restricted because, since abdominal depression was characteristically associated with strong sucking, the effect of a series of strong sucks was a generally depressed and stiffened abdomen. These confined movements were observed by Peiper (10) and Eckstein (cited by Peiper) but were not associated with the suck-reinforcing movements.

At this point it should be stated that the breathing curves failed to reveal the presence of the suck-reinforcing movements only during very weak sucking. Hence, one might conclude that the suction power for a weak suck was derived chiefly from the action of the muscles of the oral cavity and lower jaw (1, 3), but that as suction power increased, additional muscles, among which were those of the chest and abdomen, began to act in support of the sucking movements, and that in strong sucking there was general tensing (stiffening) of the skeletal muscles (5).

As a result of the varying amounts of reinforcement of the sucking movements by the chest and abdomen, three types of breathing were exhibited during feeding: unisonal, predominantly costal, and exclusively costal. In each type inspiration and expiration always corresponded with the costal inspiratory and expiratory movements. When sucking was relatively weak, the sucking rate was rapid, and breathing was generally fast and unisonal, i. e., the chest and abdomen rose and fell in unison (Figure 1—U). As the

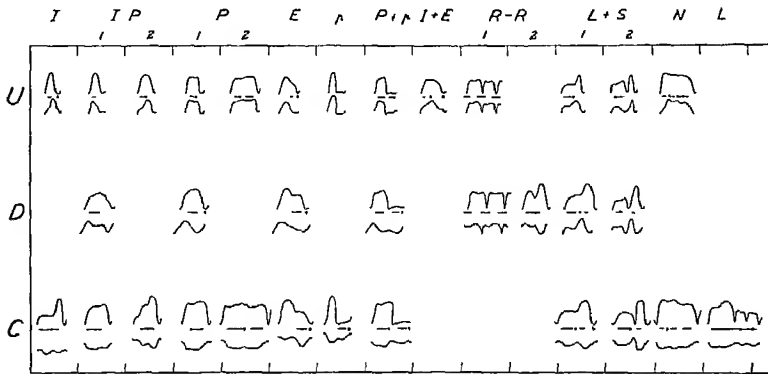


FIGURE 1
TYPES OF FEEDING

The effect on breathing of relatively weak sucking (U), moderately strong sucking (D), and strong sucking (C). The samples are tracings from the kymographic records and for the most part are arranged in order according to the position of the suck with reference to the respiratory cycle. The upper curve of each sample represents the chest; the lower curve, the abdomen. Expansion of chest or abdomen is indicated by an ascending line, contraction by a descending line. The horizontal line, representing the suck, indicates its duration with reference to the respiratory cycle. The small solid circles denote swallowing. In each sample swallowing is shown where it usually occurs. Key to lettering: U unisonal breathing; D, predominantly costal breathing; C, exclusively costal breathing; I, inspiration; P, pause after inspiration; E, expiration; p, pause after expiration; RR, respiration to respiration; L+S, long and short sucks; N, more than two sucks per respiration; L, lower jaw held depressed during two or more respirations.

sucking power increased, the abdomen gradually abandoned its rôle in breathing to strengthen its support of the sucking movements, and the burden of carrying on the breathing activity fell principally on the chest. As a result, the amplitude of the abdominal movements decreased, whereas that of the costal movements increased appreciably, and breathing became predominantly costal (Figure 1—*D*). When the power of sucking was further increased, the respiratory movements of the chest became unusually large, while the abdominal movements were relatively small and diametrically opposed to those of the chest. Breathing was now exclusively costal (Figure 1—*C*). Thus it was that in contrast to the type of breathing prevailing during deep sleep, the movements of the chest were usually larger than those of the abdomen (6).

Since the chest expanded during inspiration and also tended to expand with each suck, and to stiffen if the suck was sufficiently strong, the optimal moment for sucking, from the point of view of economy in effort, was either during inspiration or during the pause following inspiration. The data show that the good feeders managed to coördinate sucking and breathing in this manner. Their weaker sucks occurred during inspiration. A strong suck which started during inspiration increased in power as inspiration continued, and attained full strength as the chest stiffened during the pause following inspiration. Since stiffening tended to halt breathing, its occurrence at a natural pause in breathing when conditions were optimal for reinforcement of the suck caused little interference with the breathing activity.

The good feeder therefore was one who succeeded in synchronizing the breathing and sucking activities so that the breathing movements (inspiration and pause after inspiration) of the chest corresponded with its suck-reinforcing movements (expansion and stiffening). Hence, to the extent that these movements opposed, or interfered with, each other, coördination between sucking and breathing was lacking. A suck executed during expiration retarded breathing. A relatively weak suck caused only a momentary retardation of the expiratory movement. However, a strong suck not only brought breathing to a stop but, since the conditions were not favorable for a strong suck and these conditions could be met only by elevating the chest and depressing the abdomen, the effect on the costal curve was a movement similar to that produced by inspiration, whereas the effect on the abdominal curve was a greatly accelerated expiratory movement.

Subjects occasionally sucked during the pause after expiration. Since the sucks occurred at a natural pause, they interfered with breathing only to the extent of prolonging the pause slightly. The conditions, although not

optimal, were more favorable for strong sucking during this phase of the respiratory cycle than during expiration, since there were no opposing breathing movements.

The results of our analysis of the kymographic records then indicate that in each of the three types of breathing exhibited during feeding the most favorable phase in the respiratory cycle for a strong suck is the pause after inspiration when the chest is well inflated and there are no breathing movements to interfere with stiffening. Less favorable phases for strong sucking are (a) inspiration when the inspiratory movement and the suck-reinforcing movement of the chest (which precedes stiffening) correspond in direction, and (b) the pause after expiration when, despite the deflated condition of the chest, there are no breathing movements to be overcome in stiffening. The least favorable time is during expiration when the breathing movement is opposed to the suck-reinforcing movement.

In view of the above findings one can readily understand why the good feeders who sucked regularly at corresponding phases of the breathing cycles showed greater uniformity in the power and duration of their sucks than did the poor feeders who sucked at varying phases of breathing. Furthermore, since, according to the records, the form of the respiratory cycle varied with the power and duration of the suck and its position in the cycle, one can also realize why the breathing curves of the good feeder were regular while those of the poor feeders were irregular.

The fact that the good feeders revealed a predilection for applying the suction power at a particular point in the breathing cycle appeared to indicate that they had a preferred position for the chest and abdomen during the suck. The point at which the suck occurred probably depended on its power and hence would not be the same for all infants. Indeed, the point usually shifted during the feeding period as the amount of air in the bottle increased or the supply of milk at the breast decreased.

Since the poor feeders failed to reveal a preferred point in the respiratory cycle for sucking, their efforts to suck effectively at varying phases of breathing resulted in breathing curves which followed a very erratic course. The individual sucks varied widely in power and duration, and, since the milk was probably obtained in varying amounts, swallowing occurred at irregular intervals and caused additional interference with the breathing activity.

It will be noted that in discussing the way in which coordination between sucking and breathing was achieved, greater significance was attached to the movements of the chest than to those of the abdomen, and rightly so, because whereas both chest and abdomen actively participated in reinforcing

the sucking movements, it was the chest which at all times functioned actively in breathing. Even during relatively weak sucking, breathing tended to become costal in type.

Strong sucking was generally characterized by forced costal respiration. The movements of the chest and abdomen were similar to those employed by adults in the deepest possible inflation and deflation of the lungs. As the chest expanded, the abdomen was drawn sharply in and up as though to aid in elevating the ribs. The movements were reversed during expiration. Respiration then consisted of a deep rapid inspiration, a relatively long pause during which sucking occurred, and a deep fast expiration. The duration of the pause varied with the duration of the suck and was generally greater than both inspiration and expiration combined. There was no pause between expiration and inspiration. The impression gained in observing strong-sucking subjects was that they were striving to keep the chest elevated and the abdomen depressed (optimal positions for strong sucking) as much of the time as possible, but since it was necessary to breathe, expiration and inspiration were accomplished hastily between sucks. Thus it was that the sucking movements forced their rhythm on the breathing movements.

2. *Types of Feeding*

Figure 1 shows the effect of sucking on the breathing curves when sucks of varying power occur at different phases of the respiratory cycle. The samples were obtained from the best records and for convenience were designated as *types* of feeding. The various types are referred to by letters and, when necessary, also by a number. The key to the lettering is indicated in the figure. Thus the letters, *U*, *D*, and *C*, at the left of the figure refer to the three types of breathing, unisonal, predominantly costal, and exclusively costal; while the letters at the top for the most part refer to the phase of breathing during which the sucking occurs.

Before examining the curves it should be noted that in the present paper what is termed weak sucking is sufficiently strong to effect the breathing curves and therefore should not be confused with very weak sucking. In some of the records sucking was very weak and rapid, and the only apparent effect on breathing was quickened respiration. The suck-reinforcing movements, if indeed any were present, failed to impress themselves on the breathing curves.

In viewing the curves one should take into account (*a*) that since the burden of carrying on the breathing activity rests mainly on the chest, the movements of the chest will be generally larger than those of the abdomen;

(*b*) that since the optimal conditions for a strong suck are an inflated chest and a depressed abdomen, the tendency for the movements of the latter to oppose those of the former will increase as the sucking power increases; (*c*) that when sucking is strong and respiratory pauses are long, breathing will become deeper and, as a result the amplitude of the costal movements will far exceed that of the abdominal movements. In this connection, it is common knowledge that both the rate and the amplitude of the respiratory movements increase with muscular exercise to provide for better lung ventilation. Hence, in strong sucking wherein the prolonged pauses required for the sucks and the ensuing swallows greatly retard the breathing rate, a marked increase in the amplitude of the costal movements is imperative to provide for adequate lung ventilation.

Comparison of the *U*, *D*, and *C* curves reveals for the most part that the breathing movements tend to keep pace with the sucking movements and that the duration of the individual sucks varies directly with the sucking power. Slow sucking is associated with slow respiration, and fast sucking with rapid respiration. The longest sucks and the most retarded respiration occur during exclusively costal breathing when sucking is strong. The shortest sucks and most rapid respiration take place during unisonal breathing when sucking is relatively weak.

Further comparison shows that whereas relatively weak sucking effects modifications in the breathing curves only at the point where the sucks occur, strong sucking has a profound effect on the entire respiratory cycle. Note that in the *U* curves the movements of the chest and abdomen correspond in direction, except where suction power is applied, while in strong sucking the movements are generally antagonistic and in most instances actually anticipate the sucks (see *C* curves).

The costal curves of strong sucking are high and steep (due to deep and rapid inspiration and expiration) with sharp bends at the start of each suck. There is no pause between expiration and inspiration, except on rare occasions when sucking occurs at this point (see sample *C—p*). The abdominal movements are strong but shallow. The rapid elevation of the chest preceding the suck is not only an inspiratory movement but also an anticipatory suck-reinforcing movement since it results in placing the chest in the most favorable position for the suck. For the same reason the accompanying antagonistic movement of the abdomen is also an anticipatory suck-reinforcing movement. In this connection, examination of the three sets of curves shows an increasing tendency toward maintaining the chest in an elevated

position and the abdomen in a depressed position as the sucking power increases.

The *D* curves represent an intermediate stage between the *U* and *C* types of breathing. The individual sucks are longer and stronger than those of weak sucking but the suction power is applied more smoothly and, as a result, breathing is relatively slow and smooth. The effect on the breathing curves of the suck-reinforcing movements is greater than in weak sucking but less than in strong sucking. The abdominal curves clearly indicate not only support of the respiratory movements but also material reinforcement of the sucking movements.

The curves at the right of the figure, *RR*, *L+S*, *N*, and *L*, represent exceptional types of feeding. In all these types the sucks, long or short, strong or weak, attained their full power almost immediately and were supported by abrupt suck-reinforcing movements. The *RR* and *L+S* types were frequently employed for long intervals, whereas the *N* and *L* types usually occurred adventitiously, and without repetition, in the midst of a more common type of sucking.

In view of what has been said, most of the curves are self-explanatory. However, a few require interpretation. It will be noted that the effect on breathing of relatively weak sucking is an accelerated costal movement and a retarded abdominal movement when the suck occurs during inspiration (*U—I*), and an accelerated abdominal movement and retarded costal movement when the suck occurs during expiration (*U—E*). Curves like *C—IP2*, *U—RR1*, *D—RR1*, and *D—RR2* indicate that the chest and abdomen have applied their action of reinforcement twice during a single suck (one chin depression). Note also that in *U—RR1* and *D—RR1* the twice-reinforced suck begins on one respiration and ends on another. On these occasions the subject with chin depressed momentarily suspends sucking during a quick expiration and an equally rapid inspiration. Contrasting types of sucking, *N* and *L*, may be exhibited by the same subject. In the *N*-type, the subject holds his breath and executes 3, 4, or 5 quick sucks before resuming breathing. Breathing may be unisonal, as in *U—N*, or exclusively costal as in *C—N*, depending on the type of breathing during the preceding sucking. In the *L*-type the lower jaw is held depressed for 2, 3, or 4 respirations during which time the sucking power is reinforced once or twice per each respiration. This type of sucking, mentioned in an earlier paper (5) occurred only during exclusively costal breathing.

When there were two sucks per respiration, they occurred as follows:

both during the pause after inspiration ($P2$); one during the pause after inspiration and one during the pause after expiration ($P+p$); one during inspiration and one during expiration when sucking was weak (see $I+E$); or one during a pause in inspiration and the other on the continuation of inspiration ($L+S1$). Note that $L+S2$ differed from $L+S1$ in that a complete expiration took place after the first suck, as well as after the second. Hence, there was a respiration for each suck. These two types of feeding were frequently found together.

In view of the many types of feeding exhibited by the 14 subjects, one can readily realize why the costal and abdominal curves were regular in form only when the sucks occurred at corresponding phases of breathing and were uniform in power and duration.

3. *Frequency of Occurrence of Each Type of Feeding*

The frequency of occurrence of each type of feeding is shown in Table 2.

According to the data, breathing was as frequently unisonal as it was exclusively costal. The predominantly costal type occurred a comparatively small number of times.

Further study of the data without regard for the type of breathing revealed that the most common of the prevailing types of feeding was $P1$, one suck per respiration during the pause after inspiration; after which, in order of frequency of occurrence, followed $P2$, two sucks per respiration during the pause after inspiration; $L+S1$, alternate long and short sucks at the rate of two per respiration; and $IP1$ and $IP2$, sucking during both inspiration and the following pause. The least common types were N , three or more sucks during the pause after inspiration; $I+E$, sucking on both inspiration and expiration; and E , sucking during expiration.

The preferential order of feeding types which occurred 12 or more times was $P1$, $IP1$, $IP2$, $L+S2$, and I when sucking once per respiration, and $P2$, $L+S1$, and $P+p$ when sucking twice per respiration. The order confirms the statement above that subjects tend to suck during inspiration and especially during the pause after inspiration rather than at other phases of the breathing cycle. In this connection, it will be noted that the E -type which was exhibited on 23 occasions occurred only five times as a prevailing type, and that the p -type was employed only 10 times.

Of the two unusual types of feeding, N was exhibited on 13 occasions. Subject 0 employed this type on five occasions, twice as a prevailing type (see Table 1). The prolonged suck, L , in which the lower jaw was held

TABLE 2
FREQUENCY OF OCCURRENCE OF EACH TYPE OF FEEDING

Breathing	I	IP1	IP2	P1	P2	E	p	P+p	I+E	R-R1	R-R2	L+S1	L+S2	N	L	Totals
<i>Prevailing types</i>																
1. Unisonal	4	11	7	15	14	2	1	6	3	3	5	1				72
2. Predominantly Costal	2			18		2		1		4	5	1				33
3. Exclusively Costal	8	3	7	15	12	1	2	5			6	10	2			71
<i>Less persistent types</i>																
1. Unisonal	5	6	1	5	7	10	6	3			2			6		51
2. Predominantly Costal						4				1	1					6
3. Exclusively Costal	12	1	2	8	1	4	1				1	1	1	5	14	50

depressed during three or more reinforcements of the suck, occurred 14 times as a less persistent type. This type of sucking occurred only during exclusively costal breathing.

4. *Swallowing*

Swallowing refers in this paper to the transit of the milk from the mouth to the esophagus.

The data indicate that sucking and breathing may be carried on simultaneously. In order to create the negative pressure required for obtaining the milk from the nipple, the mouth must be closed at the faucial isthmus as well as at the lips. Since the entire respiratory passageway from the nose to the lungs is open and the suction pressure is not communicated to the pharynx, respiration may proceed without outright interference from sucking. That sucking can be carried on in this manner during both inspiration and expiration is easily demonstrated in adults.

The situation is quite different with respect to swallowing. The pharynx is the common passageway for the air and the food, hence for infants as well as for adults, one should expect to find the laryngeal aperture in the pharynx closed during the act of swallowing, to prevent the food from entering the larynx.

The evidence from our curves and from the stethoscopic observations indicates that the swallowing act in infants is of very short duration. The milk spurts so rapidly through the pharynx that with appropriate timing the laryngeal aperture need be closed, and breathing suspended, for but a small fraction of a second. This is equivalent to saying that a breathing pause is required for swallowing. The brevity of the pause is such that when swallowing occurs during either of the natural pauses in breathing, as it usually does in the instance of the good feeder, it is likely to escape detection, whereas, when it occurs during either inspiration or expiration its presence is indicated in the breathing curves by a momentary but quite perceptible pause. Good illustrations of the effect of swallowing during inspiration are seen in Figure 1, $C-I$, $U-L+S1$, $D-L+S1$, and $C-L+S1$. In each of these samples a long suck is followed immediately by swallowing with the lower jaw depressed. Although the pause in breathing is due in part to stiffening of the chest and abdomen in support of sucking, and probably in part to anticipation of swallowing, it is more pronounced during swallowing. Note that in these samples the inspiratory movement is continued after the pause, whereas, in

samples $U-L+S_2$, $D-L+S_2$, and $C-L+S_2$, the interrupted inspiration terminates at the pause and is followed by expiration.

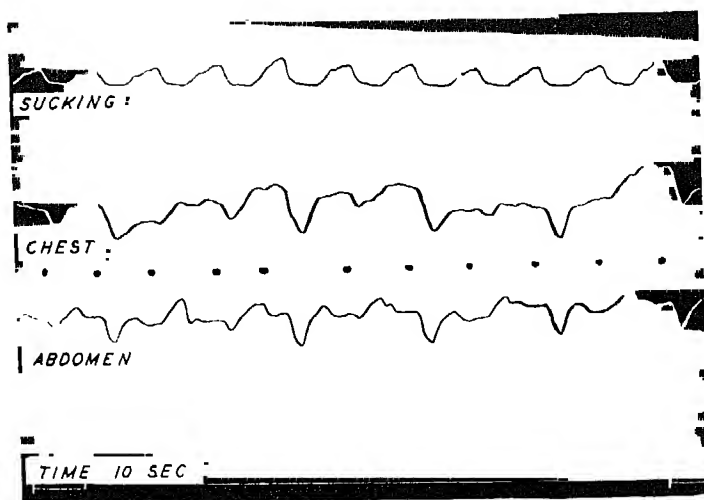
According to Clark (4) a respiratory pause of 1.4 seconds (average) was required by adults for a swallow of liquid food, whereas, according to our curves, the time required by infants for both a suck and a swallow was usually less than one second and seldom as much as 1.3 seconds in the instance of the most prolonged sucks. Measurements from the curves in which the reactions of the chest and abdomen to swallowing were distinctly shown indicated that a single swallow usually lasted 0.2-0.3 seconds. Peiper's observations (10) and the minute swallowing notches in the sucking curves of Kashara (9) and Jensen (8) confirm the fact that the act of swallowing in infants is of very short duration.

In attempting to account for the speed of infant swallowing it may be said that in contrast to the quantity of liquid swallowed at one time by the adult, the milk passing through the infant's pharynx at any one time is probably relatively small in amount and is therefore more readily swallowed. In this connection, it may be significant that the longitudinal axis of the pharynx of the recumbent infant is horizontal. Since the anteriorly located laryngeal aperture is uppermost in the pharynx, the presence of a relatively small amount of milk (heavier than air) in this passageway may not necessitate a protracted closure of the aperture.

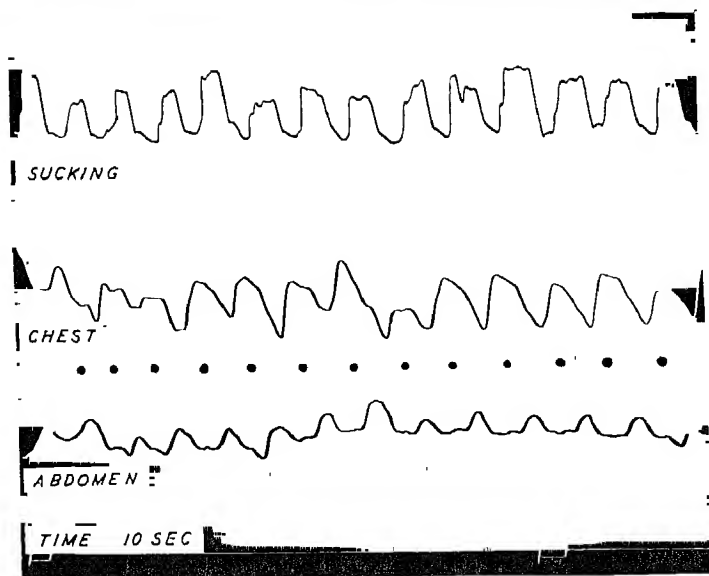
Swallowing was usually represented by a small depression on the costal curve and by an arch, resembling a swallowing respiration (7), on the abdominal curve (see Figures 1 and 2). These impressions on the curves were repeatedly checked by stethoscopic observations of the swallowing sounds. The curves sometimes failed to show the usual effects of the swallowing and merely remained level when the chest and abdomen stiffened strongly in support of sucking, specially in instances in which the swallow occurred almost simultaneously with the suck while the lower jaw was still depressed. At other times the upward surge of the abdomen following a strong suck was forceful enough to cancel the effects of the swallowing movement (on the abdominal curve), even when the costal depression was distinct.

5. *Breathing Adjustments to Sucking and Swallowing*

When coördination was good, the sucks and swallows recurred in closely-knit rhythmic units, and breathing was adjusted to the suck-swallow rhythm rather than to either of its components. Each rhythmic unit usually consisted of a suck and a swallow, two sucks and a swallow, or a pair of sucks and



A



B

FIGURE 2

TWO TYPES OF FEEDING

A. Relatively weak sucking by subject T at three weeks. Depression of the lower jaw is indicated by an upstroke on the sucking curve, expansion of chest and

abdomen by upstrokes on the breathing curves. The small dots between the breathing curves show when swallowing occurs. Breathing is unisonal in type. The sucks occur mixed once and twice per respiration. Swallowing for the most part occurs while the lower jaw is depressed. Note that the chest tends to expand and the abdomen to contract with each suck.

B. Strong sucking by subject *PA* at 18 weeks. Breathing is exclusively costal. The chest expands (inspiration) and the abdomen contracts sharply in anticipation of the suck. The sucks occur once per respiration and the power is applied during the pause after inspiration. Each suck is followed by a swallow, but the swallow does not occur until the lower jaw is about to descend or is moving down for the next suck. Swallowing is represented by a small depression or pause in the costal curve and by a small mound on the abdominal curve. Note that the act occurs during the pause after inspiration just before the suck attains its full power. Note also the irregularity in swallowing midway of the figure.

a swallow for each suck. When the unit consisted of a suck and a swallow, the sucks were uniform in power and duration, and there was one respiration for each unit (see Figure 1, Samples *I*, *IP1*, *P1*, and Figure 2, *B*). When there were two sucks per unit, the sucks in some instances were uniform in power and duration and there was a respiration for each unit (see Figure 1, *P2* and Figure 2, *A*). In other instances, the first suck of each unit differed uniformly from the second in power, duration, or both, and there was either one respiration (see Figure 1, *L+S1*) or two respirations (see Figure 1, *L+S2*) per unit. Since sucking and swallowing each effected modifications of a very definite character in breathing, viz., a long suck was associated with a long respiration, a short suck with a short respiration, a strong suck with a pause in breathing, and a swallow also with a pause, etc., each rhythmic unit had its characteristic breathing pattern.

Thus it was that although sucking and swallowing both imposed their patterns on the breathing curves, respiration remained rhythmic as long as the three activities were coördinated. This was true even when the pattern was complex, as for example, when there were two sucks per respiration (Figure 1, *C—P2*), or when the sucks occurred in groups of two in which the first suck differed uniformly from the second in power or duration (Figure 1, *C—L+S1* and *C—L+S2*).

Although sucking, swallowing, and breathing were variously coördinated, the three activities functioned most smoothly when sucking occurred during the first half of the respiratory cycle, viz., during either inspiration, or the pause after inspiration, or both, and was followed by swallowing during the same pause. Three reasons may be advanced to explain why the best feeding performances took place under these conditions. In the first place, conditions were optimal for sucking. Secondly, swallowing occurred at a natural pause in breathing. Thirdly, both sucking and swallowing occurred at fixed

points in the respiratory cycle with no appreciable pause between them. The last condition is important, since swallowing is closely linked with sucking and normally occurs as soon as the milk enters the mouth. The conditions as a whole appear to indicate that when sucking, swallowing, and breathing were well-coördinated, breathing was so regulated that sucking regularly occurred when the chest and abdomen were in positions at which they could expediently reinforce the sucking movements, and swallowing occurred naturally with reference to sucking at a natural pause in breathing.

These conditions which provided for minimum interference with the breathing activity were not fulfilled in certain types of feeding illustrated in Figure 1. In fact, unusual adjustments in breathing were frequently required to accommodate the suck-swallow unit and, as a result, coördination was impaired in accordance with the degree of difficulty experienced in making the adjustment. For example, it will be noted that in feeding types $L+S1$ and $C-I$ breathing is abruptly interrupted at mid-inspiration for sucking and swallowing. Although these types often persist for long intervals and result in regular curves, i.e., the successive cycles are similar in form, breathing cannot be said to be well-coördinated with sucking and swallowing, since the latter two activities occasion an extra pause in the breathing cycle.

Other types of feeding also reveal varying degrees of difficulty in breathing adjustment to sucking and swallowing. In the E type, expiration is either retarded or brought to an abrupt stop. In the $L+S2$ type, an abbreviated respiration is followed by a quick deep respiration to provide for adequate lung ventilation, and in the p type the suspension of breathing after expiration is also followed by a quick deep respiration. Types $P+p$, $P2$, N , and L are characteristically attended by forced breathing. Inspiration and expiration are greatly accelerated to compensate for the pauses occasioned by sucking and swallowing. Expiration is usually quite audible. Perhaps the most unusual type of feeding is the $R-R$ type in which a quick expiration is immediately followed by an equally quick inspiration while the lower jaw is held depressed. This type resembles $P1$ and may have occurred as a result of an unsuccessful attempt to apply $P1$ type of feeding.

6. *Position of the Lower Jaw during Swallowing*

The moment at which swallowing occurred could not be determined by the position of the lower jaw. When the flow of milk was steady, the time elapsing between sucking and swallowing was short and uniform. However,

since the sucks of the different subjects varied greatly in duration, the position of the jaw during swallowing also varied with the speed of its movements. Thus, swallowing after long sucks usually occurred while the lower jaw was still depressed (Figure 1, *C—I* and *C—IP1*) or was being elevated (Figure 1, *C—P2*). Whereas swallowing after short sucks might occur when the jaw was fully elevated (Figure 1, *U—IP1* and *U—RR1*) or being depressed for the next suck, (Figure 1, *C—IP2* and *U—N*). Once coordination was established the swallowing position of the jaw was relatively constant, as long as the suck-swallow rhythmic unit remained unchanged, or a change from one rhythmic unit to another did not affect the temporal relationship between sucking and swallowing. For example, note in Figure 1 that the swallowing position of the jaw is the same in Samples *U—P1*, *U—P2*, and *U—P+p*. However, since changes in the suck-swallow rhythm were common, it was not unusual to find alterations in the swallowing position of the jaw during the feeding period.

According to the data obtained from the best records of the 14 subjects, swallowing occurred 98 times when the lower jaw was depressed (Figure 2, *A*), 101 times after it was elevated, 45 times when it was on its way up, and 31 times as it was being depressed for the next suck (Figure 2, *B*).

Despite changes in the suck-swallow rhythm, some of the subjects exhibited a preferred position for the lower jaw in swallowing. *K*, *M*, *T*, and *WO*, who employed sucks of long duration (see Table 6), usually swallowed immediately after each suck while the jaw was depressed. *HA* and *PL* generally employed the short type of suck and swallowed after the jaw was elevated. *F* and *G*, two of the best feeders, carried on the swallowing actively for long intervals with the jaw first in one position and then in another, and experienced no difficulty in adjusting to the change which was necessitated by a change in the suck-swallow rhythm. The remaining subjects revealed varying degrees of irregularity in the swallowing position of the jaw.

7. Types of Feeding Exhibited by the Individual Subjects

Reference has already been made to types of feeding. After the kymographic records had been analyzed, they were classified into types of feeding in accordance with (a) the phase of the respiratory cycle at which sucking occurred and (b) the type of breathing employed.

Table 1 presents the principal types of feeding employed by the individual subjects. The prevailing and less persistent types are listed separately. Incidental types are omitted.

It will be noted that each subject, as a rule, not only exhibited alterations in type of feeding at each feeding period but also showed changes from age to age. Since these changes frequently involved changes as well in the type of breathing, the individual subjects, with one exception, commonly exhibited either two or all three types of breathing with about equal frequency as follows:

Subjects <i>M</i> and <i>PA</i>	Unisonal and exclusively costal.
Subjects <i>F</i> , <i>HA</i> , and <i>R</i>	Predominantly costal and exclusively costal.
Subjects <i>G</i> , <i>T</i> , <i>WA</i> and <i>WO</i>	All three types.
Subjects <i>K</i> , <i>O</i> , and <i>S</i>	Unisonal for first 3-5 weeks, exclusively costal later.
Subject <i>PL</i>	Exclusively costal for first 3 weeks, unisonal later.
Subject <i>HE</i>	For the most part exhibited only unisonal breathing.

Thus, as the above grouping of the subjects indicates, good feeders could not be distinguished from poor feeders on the basis of the type of breathing employed during feeding.

The data (Table 1) do not reveal the extent to which coördination was achieved by the individual subjects. It will be noted that the dominant types of feeding for the poor feeder were frequently the same as those for the good feeder. Hence, on this basis alone, it would appear that the poor feeder showed as good coördination as did the good feeder, which actually was not the case. Selection of the dominant types was based on the frequency of their occurrence. In the instance of the good feeder each of the dominant types was employed exclusively for relatively long periods of time, whereas, in the instance of the poor feeder, feeding was characterized by the absence of persistent types. Hence the selection often had to be made from an array of varied types.

The number of dominant feeding types exhibited per meal was no indication of success in coördination. The good feeder at times employed only one type as the principal means of obtaining the milk. At other times he used as many as three types (see dominant types of feeding for Subjects *F*, *G*, and *K*). Poor feeders generally exhibited two or more dominant types. However, they also exhibited less persistent types with a frequency almost equal to that of the dominant types and in addition, incidental types not shown in the table.

The manifestation of the preferred phase in the respiratory cycle for sucking was not necessarily the mark of a good feeder, otherwise *Wd* who showed a preference for sucking during the pause after inspiration would qualify as

a good feeder. In fact, poor feeders and good feeders alike displayed a preference for sucking during inspiration or the following pause. According to the data, most of the sucks occurred during the pause after inspiration or started during inspiration and ended during this pause. In view of the prevalence of changes in type of feeding, the infrequency of sucking during expiration or the pause after expiration is significant.

8. *Sucking Rates, Breathing Rates, and Suck-Respiration Ratios*

Peiper (11) found that when sucking was regular the rate was 60-96 sucks per minute. The rates obtained by Jensen (8) ranged from 60-90 sucks per minute. Examination of available curves of other investigators (3, 5), revealed rates generally exceeding 60 sucks per minute. Baliassnikowa and Model (2) classified infants as weak, normal, and active feeders. They found that the sucking rate varied greatly among the individual subjects and reported rates as high as 112 sucks per minute.

Investigations show that breathing may be either accelerated or retarded during feeding. Basch's curves (3) revealed high breathing rates with only occasional brief breathing pauses, and Baliassnikowa and Model (2) discovered that breathing accelerated during a period of sucking. On the other hand, Peiper (10) found that, whereas breathing was generally rapid when the sucking movements were of short duration, long sucking movements forced their rhythm on the breathing movements and in general retarded respiration. According to his statement the breathing rate was typically one-half of the sucking rate. The rapid breathing which attended small sucking movements was accounted for by the fact that weak sucking had little or no effect on respiration. In an earlier study (6) it was revealed that the mean breathing rate, 51.6 respirations per minute, was lower during the feeding period than during any other waking period.

The data presented in Table 3 were obtained from a half-minute section of the best kymographic record of each subject at each age level. The best record was the one in which both sucking and breathing were regular.

The table shows a wide range of sucking rates at each age for the 14 subjects and, in most instances, large variations in rate from age to age for the individual subjects. The minimum rate, 42 sucks per minute, was exhibited by *HE* at two weeks and the maximum rate, 126 sucks per minute, by *WA* at the same age. The mean and median sucking rates for all age levels were 74 (*SD* 16.8) and 72 sucks per minute respectively.

Individual differences were marked. *F*, *T*, and *WO*, all good feeders,

TABLE 3

SUCKING RATES, BREATHING RATES, AND SUCK-RESPIRATION RATIOS

Rate = number per minute. Well-coordinated sucking and breathing are indicated by ratios of 1:1 and 2:1.

An *Asterisk* preceding the ratio indicates a lack of coordination and that the ratio given is an approximate measure.

An *E* similarly located indicates an occasional lack of coordination

B indicates when bottle feeding begins.

Age: Birth-3 days	1 week		2 weeks		3 weeks		5 weeks		8 weeks		13 weeks		18 weeks	
	Suck Res S-R	Rate	Suck Res S-R	Rate	Suck Res S-R	Rate	Suck Res S-R	Rate	Suck Res S-R	Rate	Suck Res S-R	Rate	Suck Res S-R	Rate
F	66 66 1:1	45 45 1:1	48 24 2:1	57 57 1:1	66 66 1:1	72 72 1:1	84 42 2:1	54 27 2:1	69 49 E1:1	72 36 2:1	96 48 2:1			
G	78 78 1:1	68 68 1:1	B54 54 1:1	72 72 1:1	72 72 1:1	84 42 2:1	54 27 2:1	69 49 E1:1	72 36 2:1	96 48 2:1				
K	67 67 1:1	74 74 1:1	60 30 2:1	66 66 1:1	66 66 1:1	72 72 1:1	84 42 2:1	54 27 2:1	69 49 E1:1	72 36 2:1	96 48 2:1			
T	60 30 2:1	45 45 1:1	84 77 E1:1	51 51 1:1	66 66 1:1	72 72 1:1	84 42 2:1	54 27 2:1	69 49 E1:1	72 36 2:1	96 48 2:1			
HO	84 64 *1:1	78 78 E1:1	96 66 E1:1	60 60 1:1	66 66 1:1	72 72 1:1	84 42 2:1	54 27 2:1	69 49 E1:1	72 36 2:1	96 48 2:1			
S			78 78 E1:1	51 51 1:1	66 66 1:1	72 72 1:1	84 42 2:1	54 27 2:1	69 49 E1:1	72 36 2:1	96 48 2:1			
HJ			84 84 E1:1	51 51 1:1	66 66 1:1	72 72 1:1	84 42 2:1	54 27 2:1	69 49 E1:1	72 36 2:1	96 48 2:1			
M	66 37 *2:1	48 37 E1:1	78 78 E1:1	60 60 1:1	66 66 1:1	72 72 1:1	84 42 2:1	54 27 2:1	69 49 E1:1	72 36 2:1	96 48 2:1			
PA			78 78 E1:1	60 60 1:1	66 66 1:1	72 72 1:1	84 42 2:1	54 27 2:1	69 49 E1:1	72 36 2:1	96 48 2:1			
R			78 78 E1:1	60 60 1:1	66 66 1:1	72 72 1:1	84 42 2:1	54 27 2:1	69 49 E1:1	72 36 2:1	96 48 2:1			
O	102 90 *1:1	102 51 E2:1	B96 48 2:1	73 42 E2:1	69 64 E1:1	72 72 1:1	84 42 2:1	54 27 2:1	69 49 E1:1	72 36 2:1	96 48 2:1			
PL	108 78 *1:1	48 60 *1:1	63 54 *1:1	54 59 *1:1	66 66 1:1	72 72 1:1	84 42 2:1	54 27 2:1	69 49 E1:1	72 36 2:1	96 48 2:1			
HE			76 71 *1:1	42 47 *1:1	66 66 1:1	72 72 1:1	84 42 2:1	54 27 2:1	69 49 E1:1	72 36 2:1	96 48 2:1			
WA			102 84 *1:1	126 99 *1:1	66 66 1:1	72 72 1:1	84 42 2:1	54 27 2:1	69 49 E1:1	72 36 2:1	96 48 2:1			

and *M*, who at times showed good coördination, usually sucked slowly and steadily. Their sucking rates for the most part were lower than the mean rate for the group and the individual sucks were relatively long. *G* and *K*, two of the best feeders, exhibited rates which were sometimes lower and sometimes slightly higher than the mean rate for the group. Somewhat higher rates were recorded by *HA*, *PA*, and *R*, whose feeding performances were alternately good and poor. Their speed of sucking was fairly uniform throughout the experiment. In fact *HA*'s rates from age to age differed by only nine sucks per minute. *O* and *WA*, both poor feeders, usually sucked very fast. *HE* and *PL*, notably poor feeders, and *S* whose feeding performance on occasions was on a par with that of the best feeders, showed great variability in speed of sucking from week to week. Their minimum rates were considerably below the group mean and their maximum rates far above it. Their best feeding performances occurred during slow sucking.

These findings appear to indicate that conditions for achieving coördination were more favorable when the sucking rate was low than when it was high. There was no evidence of a general increase or decrease in the sucking rate with age.

The mean breathing rate for the group tended to decrease with age. However, this trend was not consistently exhibited by the individual subjects, probably because nursing conditions were not constant from week to week.

According to the data, the mean, median, maximum, and minimum breathing rates for all feeding situations were considerably lower than the corresponding sucking rates. The mean breathing rate was 58 respirations per minute (*SD* 17) and the median rate, 60. On 14 occasions the breathing rate dropped below 40 and thus approximated the sleeping rate (6). The minimum rate, 24, was exhibited by *F* at three weeks during a period of slow and well-coördinated sucking and breathing in which there were two sucks per respiration. The next lowest breathing rate, 27, was recorded under similar conditions by *T* at eight weeks. The maximum rate, 99 respirations per minute, was exhibited by *WA* at two weeks. Note that *WA* also had the highest sucking rate.

Comparison of breathing and sucking speeds in the 86 feeding situations showed that the breathing rate was lower than the sucking rate on 50 occasions and higher than the sucking rate on only four occasions. However, the breathing movements tended to keep pace with the sucking movements. When sucking was slow, breathing was slow. When the sucking rate in-

creased, the subject either accelerated his breathing, or slowed it to accommodate two sucks per respiration. Six subjects showed a tendency to suck once per respiration. Two subjects, *O* and *T*, indicated a preference for sucking twice per respiration. According to the data, the suck-respiration ratio was 1:1 in 52 feeding situations and 2:1 in 23 feeding situations. Mixed trends of one and two sucks (occasionally 3) per respiration were evidenced on 11 occasions. Six subjects failed to show a preferred suck-respiration ratio.

Excellent feeding performances occurred with both the 1:1 and the 2:1 suck-respiration ratios, and analysis of the records showed that coördination was as good with one ratio as with the other.

Of the 41 feeding situations in which very good coördination was exhibited, the suck-respiration ratio was 1:1 in 27 instances and 2:1 in 14 instances. In other words, feeding performances were good in 52 per cent of all situations in which the 1:1 ratio was employed and in 61 per cent of all situations in which the 2:1 ratio prevailed. Coördination was also revealed throughout the greater part of 22 other situations. The suck-respiration ratio was 1:1 in 10 of these 22 instances, 2:1 in 5 instances, and mixed 1 and 2 (and even 3) in 7 instances. Little or no coördination was evidenced in the remaining 23 situations. Of the three best feeders, *G* always sucked once per respiration, whereas *F* and *K* performed as well with two sucks as with one suck per respiration. The three poorest feeders were *PL*, *HE*, and *WA*. Their sucks for the most part occurred at varying phases of breathing. *PL*'s suck-respiration ratio was approximately 1:1 for the first three weeks and 2:1 after three weeks. *HE* and *WA* usually sucked about once per respiration. Examination of the records of the remaining subjects who revealed varying degrees of ability in feeding showed 11 good and 5 very poor feeding performances when the suck-respiration ratio was 1:1 and 8 good and 4 very poor performances when the ratio was 2:1. In passing, it was noted that the tendency to suck twice per respiration increased with age.

The most favorable conditions for coördination were relatively low sucking and breathing rates, and the most unfavorable conditions were high breathing and sucking rates. Table 4 shows the number of good, fair, and poor feeding performances under each of the following conditions: (*a*) slow sucking and slow breathing, (*b*) fast sucking and fast breathing, and (*c*) fast sucking and slow breathing. Both sucking and breathing were arbitrarily called slow when the rate was 72 or less sucks or respirations per minute. Fair performances were those in which coordination was occasionally lacking (see Table 3).

TABLE 4

NUMBER OF GOOD, FAIR AND POOR FEEDING PERFORMANCES WHEN BOTH SUCKING AND BREATHING WERE SLOW, WHEN BOTH SUCKING AND BREATHING WERE FAST, AND WHEN SUCKING WAS FAST AND BREATHING SLOW

	No. of feeding performances		
	Good	Fair	Poor
Slow sucking and slow breathing	31	4	9
Fast sucking and fast breathing	4	5	6
Fast sucking and slow breathing	6	12	9

According to the data the number of good performances was relatively much larger when both sucking and breathing were slow than when either or both were fast. Good or fair performances were exhibited in 80 per cent of the instances in which both sucking and breathing were slow, in 67 per cent of the instances in which sucking was fast and breathing slow, and in 60 per cent of the instances in which both sucking and breathing were rapid.

Comparison of the speed of sucking and breathing for the good and poor feeding performances revealed that on the average both sucking and breathing were slower for the good performances than for the poor performances. According to the data (Table 3) the mean breathing and sucking rates per minute were 55 respirations and 67 sucks for the 41 good performances, 60 respirations and 82 sucks for the 21 fair performances, and 63 respirations and 81 sucks for the 24 poor performances. Comparison of the sucking and breathing rates of the three best and the three poorest feeders yielded similar results. The mean sucking rate and the mean breathing rate were respectively 14 sucks and 9 respirations lower per minute for the best feeders than for the poorest feeders. Furthermore, the sucking rate was higher than 72 sucks per minute in 10 of the 16 feedings for the poorest feeders and in only 5 of 21 feedings for the best feeders. The breathing rate exceeded 72 respirations per minute in five of the feedings for the poorest feeder and in only one of the feedings for the best feeders. Incidentally, only the poorer feeders exhibited breathing rates higher than 80 respirations per minute.

Analysis of the kymographic records revealed that a high breathing rate was more detrimental to coordination than was a high sucking rate. This fact may explain why the breathing rate was lower than the sucking rate in the majority of the feedings, and why it seldom exceeded 72 respirations per minute, whereas the sucking rate was higher than 72 in approximately 50 per cent of the feedings.

Examination of the data (Table 3) showed that of the 15 feeding per-

formances in which the breathing rate was higher than 72, 4 were good, 5 fair, and 6 poor. Of the 42 performances in which the sucking rate exceeded 72, 10 were good, 17 fair, and 15 poor. Thus the percentage of good and fair performances was about the same for fast sucking as for fast breathing. However, further study of the data showed (*a*) that of the 15 poor performances which occurred when sucking was fast, 13 took place either when breathing was also fast or when the subject employed mixed suck-respiration ratios (see Table 3); and (*b*) that of the 10 good performances, 6 occurred when breathing was slow, viz., only one-half as fast as sucking.

TABLE 5

DISTRIBUTION OF GOOD, FAIR, AND POOR FEEDING PERFORMANCES WITH REFERENCE TO THE NUMBER OF SUCKS PER RESPIRATION WHEN THE SUCKING RATE EXCEEDED 72 PER MINUTE

Suck-respiration ratio	No of performances		
	Good	Fair	Poor
2:1	6	4	2
1:1	4	7	9
Mixed	0	6	4

Table 5 shows the distribution of the good, fair, and poor feeding performances when the sucking rate exceeded 72. The distribution indicates that when the breathing rate was low and the sucks occurred regularly twice per respiration, less than 20 per cent of the fast sucking performances was poor, but that when the breathing rate was high almost 50 per cent of the performances was poor. In passing it will be noted (Table 3) that good feeding performances occurred with sucking rates of approximately 100 when the suck-respiration ratio was 2:1. In fact, one subject, *M*, gave a fair performance at 18 weeks with a sucking rate of 120. The highest respiratory rate for good performance was 84.

The results appear to indicate that when the sucking rate is high, coördination is more likely to be maintained with a 2:1 suck-respiration ratio than with a 1:1 ratio. Breathing apparently cannot keep pace with sucking when the rate is much over 80 sucks per minute. It will be noted that two of the best feeders, *F* and *K*, employed the 2:1 suck-respiration ratio during rapid sucking. *O*, a poor feeder, who sucked fast, rendered his best performances when sucking twice per respiration, and *WA*, another fast feeder, who generally sucked once per respiration, failed to show any coördination.

9. *Duration of Individual Sucks*

Observations of the movements of the lower jaw revealed variations in the manner of sucking. The individual sucks varied in duration and were generally classified as short and long. The short suck was associated with rapid depression and immediate elevation of the lower jaw. In the long suck, these movements were either accomplished at a relatively slow speed, or the jaw after being quickly depressed was held down for a time before it was elevated. *WA* always employed the short type of suck. *K* and *WO*, on the other hand, employed the long type. The remaining subjects used both types during the same feeding period or at different age levels. Sometimes the short suck was employed at one stage of the feeding period and the long suck at another stage. At other times they were combined rhythmically (see Figure 1, *C—L+S1*), and at still other times when coördination was lacking they occurred in irregular order.

Table 6 presents data relating to the duration of the individual sucks and to the time between successive sucks. The subjects were grouped in order from the best to the poorest feeders. The data were obtained from a 10-second section of those records, one at each age level, in which the best coördination was exhibited. The best feeding performance of each subject was then determined from these records. The duration of a suck was the time elapsing between the start of the downward movement of the lower jaw and the start of its upward movement. The duration of the interval between sucks was the time elapsing between the start of the upward movement and the next downward movement. In passing, it should be recalled that swallowing, as well as sucking, frequently occurs when the jaw is depressed. In such instances one cannot determine the exact duration of the suck, hence the data actually indicate the duration of depression and of elevation of the jaw.

According to the data, the average mean duration of the individual sucks was .40 seconds or longer for the subjects of Groups *a* and *b*, between .30 and .39 seconds for Group *c*, with one exception, and less than .30 seconds for the two remaining groups, with the exception of *HE* who was the most voracious feeder. Thus, it would seem that as a rule, subjects who employed long sucks were more successful in achieving coördination than were subjects who employed short sucks. Furthermore, the best feeding performance of the poorer feeders occurred when subjects were employing sucks the duration of which was usually considerably greater than the average mean duration of their sucks.

TABLE 6
MEAN DURATION OF THE INDIVIDUAL SUCKS AND OF THE INTERVALS BETWEEN SUCKS FOR ALL SUBJECTS

Groups	Subjects	Duration of sucks		Duration of intervals between sucks		Best performance	
		Average mean duration	Range of the means for the different age levels	Average mean duration	Range of the means for the different age levels	Mean duration of sucks	Mean duration of intervals between sucks
		(sec.)	(sec.)	(sec.)	(sec.)	(sec.)	(sec.)
<i>a.</i>	<i>F</i>	.47	.32-.61	.55	.31-.64	.48	.37
	<i>G</i>	.45	.34-.63	.44	.39-.48	.44	.47
	<i>K</i>	.40	.33-.47	.43	.36-.49	.42	.42
<i>b.</i>	<i>T</i>	.45	.37-.55	.49	.37-.63	.45	.46
	<i>WO</i>	.57	.32-.80	.51	.40-.58	.53	.58
<i>c.</i>	<i>S</i>	.39	.26-.50	.41	.36-.50	.49	.38
	<i>M</i>	.31	.16-.41	.58	.29-.90	.41	.54
	<i>PA</i>	.34	.27-.51	.46	.38-.57	.51	.39
	<i>R</i>	.31	.23-.39	.47	.43-.54	.39	.45
	<i>HA</i>	.27	.21-.34	.48	.43-.51	.34	.45
	<i>O</i>	.26	.20-.34	.45	.34-.74	.34	.37
<i>d.</i>	<i>PL</i>	.28	.21-.46	.54	.30-.79	.46	.79
<i>e.</i>	<i>HE</i>	.37	.22-.58	.52	.36-.85	.40	.41
	<i>WA</i>	.23	.16-.28	.37	.31-.43	.28	.43

According to the range of the means for the different age levels, the sucks, as a rule, varied considerably in duration from age to age for good and poor feeders alike. However, they were quite uniform in duration during any period when feeding and breathing were coördinated. It will be noted that in the instance of the good feeder, the suck and the interval between sucks were of about equal duration, but that in the instance of the poor feeder the duration of the suck, for the most part, was relatively much shorter than that of the interval between sucks. The minimum mean duration of the sucks was greater than .30 seconds for the good feeders and less (in most instances much less) than .30 seconds for the poor feeders.

10. *Comparison of Amplitudes of the Movements of Chest and Abdomen*

The mean amplitude of the movements of the chest and the abdomen was determined from the curves according to the method employed in an earlier study (6). The data for each subject at each feeding are presented in Table 7.

TABLE 7
MEAN AMPLITUDE IN MM. OF THE MOVEMENTS OF CHEST AND ABDOMEN FOR EACH SUBJECT AT THE DIFFERENT AGE LEVELS
C denotes the Chest, *A* the Abdomen.

Age in weeks:		0		1		2		3		5		8		13		18	
		<i>C</i>	<i>A</i>	<i>C</i>	<i>A</i>	<i>C</i>	<i>A</i>	<i>C</i>	<i>A</i>	<i>C</i>	<i>A</i>	<i>C</i>	<i>A</i>	<i>C</i>	<i>A</i>	<i>C</i>	<i>A</i>
<i>F</i>		3	2	3	4	8	5	14	4	8	3	11	6	4	3	13	5
<i>G</i>		2	4	3	7	3	3	5	8	4	3	7	7	—	—	—	—
<i>K</i>		3	2	5	4	4	2	—	—	9	4	9	3	11	5	8	4
<i>T</i>		4	7	—	—	7	5	7	7	6	3	6	3	7	5	7	6
<i>WO</i>		—	—	—	—	8	6	9	10	10	8	—	—	7	4	7	5
<i>S</i>		6	6	—	—	4	5	5	9	8	3	11	4	—	—	—	—
<i>HA</i>		—	—	4	5	—	—	4	2	7	4	11	6	7	6	4	2
<i>M</i>		4	2	7	4	13	7	—	—	25	6	11	6	8	7	6	5
<i>PA</i>		—	—	7	4	—	—	8	5	5	4	6	2	7	6	9	4
<i>R</i>		—	—	5	9	—	—	8	6	10	6	5	5	5	2	8	5
<i>O</i>		5	5	9	8	—	—	4	6	9	5	18	7	16	4	9	5
<i>PL</i>		3	4	—	—	10	6	6	6	—	—	8	6	11	4	8	3
<i>HE</i>		—	—	3	5	4	2	4	4	3	4	—	—	7	3	8	4
<i>WA</i>		—	—	6	5	3	3	—	—	—	—	—	—	6	4	7	2

The prominence of the costal movements is clearly indicated. Comparison of the two curves showed that the costal movements were larger than the abdominal movements in 63 of the 86 feeding situations and smaller than the latter in only 14 instances. The trend toward larger costal movements was revealed by 3 of the 14 subjects at all feedings and by 10 other subjects in the majority of their feedings. Only one subject, *G*, revealed the reverse

trend. Further comparison (see Tables 1 and 7) showed that the movements of the chest were usually larger during exclusively costal breathing than during either unisonal or predominantly costal breathing and, on the average, much larger than those of the abdomen during exclusively costal breathing than during either of the other types. According to the data, the mean of the individual mean amplitudes of the costal and abdominal movements for the three types of breathing was as shown in Table A. In addition, according

TABLE A

Type of breathing	Costal movements	Abdominal movements
Exclusively costal	9.0 mm (<i>SD</i> 4.3)	5.4 mm. (<i>SD</i> 1.7)
Predominantly costal	5.8 mm. (<i>SD</i> 2.7)	4.6 mm. (<i>SD</i> 1.6)
Unisonal	6.0 mm. (<i>SD</i> 2.1)	5.0 mm. (<i>SD</i> 2.0)

to the individual means, the amplitude of the costal movements exceeded that of the abdominal movements in 85 per cent of the instances of exclusively costal breathing, in 67 per cent of the instances of predominantly costal breathing, and in 65 per cent of the instances of unisonal breathing. Observation of the subjects during feeding revealed that one of the reasons for the conspicuousness of the movements of the chest was that they were characteristically more abrupt than those of the abdomen, particularly during exclusively costal breathing (strong sucking). Indeed, comparison of the curves showed that changes in the expiratory position were greater for the chest than for the abdomen in 71 of the feeding situations and that the changes were generally maximum during strong sucking.

11. *When Coordination Was First Exhibited*

The age at which coordination between breathing and the sucking and swallowing activities was first exhibited varied from subject to subject. One subject, *G*, showed good coordination eight hours after birth at her first feeding. As soon as she was placed at the breast she made three feeble sucks. From there on she proceeded as follows: rested two seconds, made five strong sucks in rapid succession; rested six seconds, and sucked four times. No coordination was shown up to this time. After a rest period of five seconds she sucked regularly once per respiration 13 times, showing coordination. From this point on, the sucks occurred regularly once per respiration in series of 12 to 21. Subjects *F*, *K*, and *T* showed coordination within the first three days, and eight other subjects exhibited coordination on one or more occasions at varying stages before the experiment was concluded. *HE*

and *WA* consistently failed to maintain a steady temporal relationship between the breathing and the food-taking activities, and subsequent tests at 24 weeks revealed no improvement in feeding performance (see Table 3).

12. *Why Feeding Performances of the Best Feeders Were Generally Good*

Feeding conditions were probably as variable for one subject as for another. Breast feeding in the first weeks of life was later followed by bottle feeding. Bottle nipples were selected at random from as many as 40 nipples.

As a result of our findings, it would appear that when food-taking and breathing are proceeding with minimum mutual interference, swallowing is taking place during either the pause after inspiration or the pause after expiration. Although sucking can occur at any time, since the oral cavity during sucking does not communicate with the pharynx, there is probably a phase in the respiratory cycle when, because of the position of chest and diaphragm, conditions are optimal for suction power. The optimal phase for the suck will not be the same for all infants, or, in fact, throughout a single feeding period. Rather, the time at which the pressure will be applied will probably be determined by factors such as the efficiency of the infant's sucking mechanism and the ease or difficulty experienced in obtaining milk from the nipple.

Hence, when nursing is proceeding smoothly and each suck is followed by a swallow, it may be assumed that the suck is of sufficient power to obtain a satisfying amount of milk and that the swallow is moving the milk past the laryngeal aperture at a favorable moment. In this case we would expect to find a steadily maintained temporal relationship between the suck-swallow sequence and the respiratory cycle. Obviously the relationship would be modified if there were two sucks per swallow.

The uniformly good performances of the best feeders were due to the fact that these subjects were able to maintain coördination under conditions in which other subjects usually failed.

Feeding performances varied from superior to very poor in accordance with the degree of coördination or disorganization of the sucking, swallowing, and breathing activities. Note, in this connection, that when coördination was shown, the three activities proceeded more smoothly with some types of feeding than with others.

Coördination was characteristically good when subjects appeared relaxed and at ease in the feeding situation. The conspicuous features of their feeding behavior were the rhythmic movements of chest and lower jaw and the apparent ease with which they obtained and disposed of (swallowed) the

food. Restlessness was associated with difficulty in feeding. Poor feeders, such as *HE*, *PL*, and *WA*, were continually restless, as evidenced by frequent changes in body posture and numerous movements of head and limbs.

However, since feeding conditions were not constant from age to age or even during a single feeding period, all subjects at times experienced varying degrees of difficulty in obtaining the food. It was in coping with these difficulties that the best feeders showed their superiority over the other subjects. Sucking and breathing tended to become irregular. Unless sucking power could be regulated to yield an appropriate amount of milk for swallowing to occur regularly, and breathing could be appropriately adjusted to the changes in sucking and swallowing, the three activities would become disorganized. The best feeders invariably managed to fulfill these conditions by employing a type of feeding by means of which coordination could be preserved, even when the change involved alterations in the temporal relationship between sucking and swallowing. Thus, the breathing curves, although altered in form, were regular. Some of the better feeders among the remaining subjects were similarly successful at times. Analysis of the kymographic records showed that when difficulty was experienced in feeding, the irregularities in the breathing curves of the good feeders at the onset represented adjustments in breathing by means of which coordination was preserved, whereas the irregularities in the curves of poorer feeders evidenced immediate disorganization.

13. *Principal Causes of Non-Coordinated Sucking, Swallowing, and Breathing*

According to the present study the principal causes for non-coordinated sucking, swallowing, and breathing appeared to be as follows:

1. Inability of the subject to adjust his suction power to the pressure required to obtain the milk in an appropriate amount so that swallowing may occur at regular intervals. Although sucking power increases with age, in view of the fact that different nipples yield milk at varying suction pressures, it would seem that regulation of the power and timing of its output rather than sheer power itself are more essential in establishing coordination between breathing and the food-taking activity.

2. The nipple may be obstinate, or it may yield the milk too easily. Present records indicate that the three activities become disorganized when an infant is forced to exert himself unduly to obtain the milk. Sucking cannot be maintained uniform in power, breathing is brought to a stop for each

suck, generally at varying phases of the respiratory cycle, and inspiration and expiration are carried on hurriedly between sucks. Frequent postural changes, stiffening, and abrupt bodily movements, the apparent purpose of which is the reinforcement of the sucking movement, enter into the feeding behavior. A nipple that yields milk too easily may also bring about the disorganization of the food-taking and breathing activities. The milk entering the mouth per suck may be too great in amount to be disposed of adequately by an infant's normal manner of swallowing. In this case the excess milk will run out of the corners of the mouth or interfere with breathing by blocking its course in the pharynx.

3. Unusual avidity in feeding.

4. Rapid breathing. According to our data, coördination was seldom exhibited when the breathing rate exceeded 80 respirations per minute.

5. Rapid sucking, when breathing is also rapid.

6. Good feeders sometimes fail to maintain coördination throughout the entire feeding period. The failure may be due to fatigue, diminished milk supply at the breast, clogging of the artificial nipple, or pressure changes within the bottle.

14. *Brief Description of the Feeding Behavior of the Poorest Feeders*

The three poorest feeders were *PL*, *HE*, and *WA*. A brief description of their feeding performances may throw light on why infants sometimes fail to show coördination.

In the case of *PL*, the difficulty seemed obvious. *PL* was the smallest baby of the group. Although her physical condition was good, she evidently lacked sufficient sucking power to obtain the milk easily enough to permit regular swallowing and uninterrupted breathing. Periods of strong sucking in which she appeared to put an unusual amount of effort into sucking, as indicated by frequent stiffening, abrupt bodily movements, and grunting, were followed by periods of rest or weak sucking.

HE was a large healthy baby of good disposition. He gained rapidly in weight, appeared always to be hungry, and became excited at feeding time. Although the milk flowed easily, he sucked with great avidity as long as the supply lasted. He frequently held his breath and sucked three, four, or five times before resuming breathing. He sucked in whatever way was advantageous for obtaining the milk rapidly and permitted breathing to occur as it could. At no time was there any indication of coördinated sucking and breathing, probably because of failure to adjust his sucking power to the pressure required to obtain the milk.

WA was a baby of average size. She never appeared to be hungry and was easily disturbed when she did feed. She obtained the milk easily, but sucked sporadically, and usually for short intervals only. Successive sucks differed widely in power and spacing, and her rapid respiration failed to keep pace with the quick sucking movements.

G. SUMMARY AND CONCLUSION

Simultaneous records of sucking, swallowing, and breathing were obtained in order to determine how these activities were carried on during infant feeding. The subjects were 14 infants. Records were taken at the following ages: Birth to 3 days, 1, 2, 3, 5, 8, 13 and 18 weeks. Sucking and breathing movements were recorded kymographically. Breathing movements were obtained from both chest and abdomen. Swallowing (transit of the milk through the pharynx) was observed stethoscopically and related to the breathing movements as they were being recorded. Study of the records showed:

1. The chest and abdomen functioned not only in breathing, but also in reinforcement of the sucking movements, the chest by expanding and stiffening, the abdomen by contracting and stiffening. Stiffening was associated with very strong sucking. The effect on breathing of these suck-reinforcing movements was to increase the amplitude of the costal movements and to inhibit the abdominal breathing movements. As the sucking power increased, the costal movements became larger and the abdominal movements smaller until a point was reached at which the suck-reinforcing movements of the abdomen were stronger than its breathing movements and a paradoxical situation arose in which the movements of the abdomen opposed the breathing movements of the chest.

2. Three types of breathing were exhibited during feeding as a result of the differential effects on the costal and abdominal breathing movements of differences in the power of the suck-reinforcing movements. Breathing was unisonal (and rapid) during relatively weak sucking, predominantly costal during relatively strong sucking, and exclusively costal during very strong sucking.

3. Sucking and breathing were carried on simultaneously, except during strong sucking when the chest and abdomen stiffened to reinforce the sucking movements. The strongest sucks occurred during the pause after inspiration with the chest well inflated and the abdomen strongly depressed.

4. The act of swallowing was of very short duration and always occurred

during a pause in breathing. When this pause coincided with a natural pause in breathing, it caused little or no interference with the breathing activity. When swallowing occurred during either inspiration or expiration, breathing was abruptly interrupted.

5. Strong sucks were generally of relatively long duration, weak sucks of relatively short duration. Breathing was generally slower during strong sucking than during weak sucking.

6. Sucking and swallowing occurred as a continuous movement when the milk flowed evenly. The position of the jaw during swallowing appeared to depend on the speed of its movement, and this in turn on the power of sucking.

7. When sucking, swallowing, and breathing were well coördinated, the sucks and swallows recurred in rhythmic units and breathing was adjusted to the suck-swallow rhythm. The suck-reinforcing movements of the chest coincided with those of breathing, and swallowing occurred at a natural pause in breathing. Since breathing was chiefly a function of the chest, sucking occurred during either inspiration (chest expanding), the pause after inspiration (chest expanded), or both, depending on the power and duration of the sucks. Swallowing took place at a natural interval after sucking during the pause after inspiration. Various types of coördination were exhibited, some of which were better than others.

8. The position of the chest and abdomen during each suck was relatively constant during a period of coördinated sucking, swallowing, and breathing. The position appeared to depend on the amount of power required to obtain the milk in appropriate amounts for swallowing, viz., the stronger the suck, the higher the chest and the lower the abdomen. The regular recurrence of the suck-reinforcing movements with reference to breathing appeared to be indicative of a preferred phase in the respiratory cycle for sucking and of preferred positions for chest and abdomen for the release of an appropriate amount of sucking power.

9. When good coördination was exhibited, the subjects were sucking regularly either once or twice per respiration. Coördination was as good with one suck-respiration ratio as with the other.

10. A relatively low breathing rate appeared to be more essential for achieving coördination than did a low sucking rate. Coördination was most frequently achieved when both the sucking rate and the breathing rate were relatively low and least frequently achieved when both rates were high. However, a high sucking rate combined with a low breathing rate frequently resulted in good coördination when the suck-respiration ratio was 2:1.

11. Good nursing conditions should provide that breathing as well as sucking and swallowing proceed with regularity. The nipple should yield milk at a suction pressure well within the infants power. The milk obtained in a unit suck-swallow sequence (whether there be one or two sucks per swallow) should be appropriate in amount to the capacity of the swallowing mechanism. The sucking-swallowing operation should be efficient enough to function in rhythmic coördination with breathing.

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THE WISHES OF NEGRO SCHOOL CHILDREN*

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This study has had as its purpose the investigation of the interests of Negro school children through an analysis of the wishes which they express. An attempt has been made to discover the nature of the wishes of Negro children from fairly typical Southern schools, to find developmental trends, if present, both as to age and as to grade placement, to ascertain whether any sex differences are present, and finally to study the relation of type of wish expressed to economic status.

In its plan the study has followed rather closely a similar investigation by Boynton (1) of the wishes of white children of elementary school age. It was believed that aside from any value of a study in the interests of the Negro child *per se*, a comparison of the Southern Negro child with the white child might yield some data of worth in the consideration of the origin of interests. Since, in the South at least, the Negro and the white form two rather distinct groups in most ramifications of the life of a community, differences in the interests of the two groups might be expected to appear if the interests of children may be explained in terms of widespread group influences. In his study of the interests of white children, Boynton (2), after an analysis similar to the one to be presented in this paper, reached the conclusion that "children's wishes, or fundamental interests, cannot be explained satisfactorily in terms of group causes or affiliations. . . . In truth, it would seem that the child's wishes must go back to the *particular* experiences through which he as an individual child has passed." If this conclusion has general validity, we may expect that between the Negro and white groups consistent and clearcut differences will not be found since interests will depend upon the experiences peculiar to the child rather than those common to his so-called racial group as opposed to any other group. To test this hypothesis will be a secondary purpose of the present study.

PROCEDURE

The subjects in this study were Negro children from grades one to six

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in a fairly large Negro school in Nashville, Tennessee, and two smaller schools in a North Carolina and a Tennessee town. These schools were selected as being fairly typical of Negro urban schools; it may be, however, that the fact of the cooperation of the schools in the collection of the data indicates a somewhat superior type of school in certain respects. Of approximately 900 cases, there were 820 the records upon which were complete enough to permit their use in the study. As in Boynton's study with white children each child was asked the following question:

If you could have anything in all the world that you might want, just *anything*, what would you ask for? Put down just ONE thing—that one thing you would rather have than anything else you can think of.

In grades four to six the child read the question as presented upon a mimeographed sheet and wrote his own response. The teachers were instructed to assist the children wherever necessary but in no way to influence their responses. In the first three grades the teacher read the question to each child individually and recorded his response, care again being taken not to influence the child.

The use of such a method of studying the interests of children may be open to question as it is likely that the responses of certain of the children may have been dependent upon caprice or passing fancy. It is also possible that the responses might have been influenced in certain cases by the children's tendency to express only socially approved interests. It is difficult to devise a method of studying the interests of children which would avoid the tendency of children to evince only socially acceptable responses, whether the method is one of questionnaire, interview, or observation. In view of the essentially subjective nature of children's interests, it appears to the writer that a method of direct questioning is probably justifiable in such a study as the present one. Certainly, when it is desirable to study the interests of a relatively large number of children, such a method is probably the most feasible. While it is entirely possible that the method employed lacks validity for individual cases, the cancelling out of errors should make group responses of sufficient validity to warrant their use. It should be remembered, however, that the data presented upon the following pages and the conclusions drawn therefrom are strictly limited to the method of investigation employed.

At the time at which the children were questioned concerning their wishes, an attempt was made also in the case of each child to obtain some sort of approximate rating of the economic status of his home. The scoring plan which was used to obtain this rating was virtually the same as that used by

Boynton. This plan gave five points if either parent was employed, four additional points if the employment was professional, three if semi-professional, two if skilled labor, and one if semi-skilled. Two points were given for one or more room per person living in the home, and one point for 0.50 to 0.99 rooms per person. A point was given for a bathroom and a point for furnace or steam heat, and one point each for an electric refrigerator, a radio, and an automobile. It was recognized that such a rating scale as this will yield no fine discriminations and that it may be of somewhat doubtful validity with the population studied. The device was not employed, however, to yield fine differentiations; its only purpose was to obtain two groups rather widely separated, one high and one low, to study in contrast.

RESULTS

The responses of the children were distributed first according to age and sex for the specific wishes given. These findings are presented in Table 1 which shows the percentage of children expressing each wish. In this table all wishes are listed as miscellaneous which appeared less than four times for boys and girls combined. Probably the most interesting feature of this table is the high preference shown for a bicycle, the most frequently given of all responses, and for an automobile. These two responses cover 42 per cent of all the responses of the boys and 35 per cent of the girls' responses. Throughout, the grouping of the interests of the children around a very small number of wishes was very striking. The six wishes highest in frequency include for the total group 73 per cent of the responses of boys and 71 per cent of those of the girls. This piling up is true of each age level as well, the lowest per cent included in these six being 63 per cent for boys at year 12, and the highest, 84 per cent for boys at year 13. This small range of interests is more marked than it was in Boynton's study in which only 57 per cent of the wishes of the boys and 48 per cent of those of the girls fell within the six most frequently expressed wishes.

The similarity between the present study and Boynton's, however, in the nature of the wishes expressed is marked. In Boynton's study the bicycle was also found to be the thing most frequently wished for and the automobile to be second in favor. Boynton's percentages, however, are smaller, 16 and 15 for the bicycle as compared to 21 and 22 for the Negro children, and 14 and 8 for the automobile as compared to 21 and 13 here reported. In order, the six things most frequently wished for by the white children were: bicycle, automobile, money, pony, clothing, and a home. For the Negro

TABLE 1
PERCENTAGES OF CHILDREN EXPRESSING VARIOUS WISHES FOR EACH AGE AND SEX

Wish	Sex	Ages											All
		6	7	8	9	10	11	12	13	14	15		
Bicycle	<i>B</i>	4	3	20	14	31	21	25	33	27	22	21	
	<i>G</i>	5	6	15	24	30	24	37	31	16	6	22	
Automobile	<i>B</i>	38	49	20	35	20	15	8	12	15	11	21	
	<i>G</i>	24	39	10	7	9	7	7	6	15	25	13	
Home	<i>B</i>	12	14	25	14	14	11	9	27	12	11	15	
	<i>G</i>		6	10	12	18	15	18	11	10	6	11	
Clothes	<i>B</i>	4	5	8	2	9	6	12	4	5		7	
	<i>G</i>	19	19	10	7	9	10	2	4			8	
Money	<i>B</i>	8	3	6	9	2	17	9	8	5		8	
	<i>G</i>				10	7	8	2	9	4	6	5	
Piano	<i>B</i>						2					.5	
	<i>G</i>	19	11	13	10		10	11	6	15	25	11	
Education	<i>B</i>	4				4	4	13	4	5		4	
	<i>G</i>					5	7	4	10	4		4	
Radio	<i>B</i>	8	3	4	2			2				2	
	<i>G</i>	3		13	10	3	1	1				3	
Food	<i>B</i>		3	2	7	4	6	2	2	2		3	
	<i>G</i>	3		2	2				2			1	
Watch	<i>B</i>												
	<i>G</i>					5	4	5	9	11	6	4	
Health	<i>B</i>				2	2		6	4	2		2	
	<i>G</i>		3		2		1	5				1	
Electric refrigerator	<i>B</i>					2						.3	
	<i>G</i>	3	8	4			1		4	4		3	
Furniture	<i>B</i>					2						.3	
	<i>G</i>	3	3	4	2	2	1			7	6	2	
Pony	<i>B</i>	4	5	2	2			4	2	2		2	
	<i>G</i>	3				2						1	
Toys	<i>B</i>	8	3	2								1	
	<i>G</i>	8	3	2			1					1	
Skates	<i>B</i>				2							.3	
	<i>G</i>		3	4	2	5	1		2			2	
Doll	<i>B</i>												
	<i>G</i>			4	5		1	1				1	

TABLE 1 (*continued*)

Wish	Sex	Ages											All
		6	7	8	9	10	11	12	13	14	15		
Horse	<i>B</i> <i>G</i>	4	5	2									1
Musical instrument	<i>B</i> <i>G</i>						4			2			1 .3
Airplane	<i>B</i> <i>G</i>					2					2	11	1 .2
Motorcycle	<i>B</i> <i>G</i>		3	2			2	2			2		1
Telephone	<i>B</i> <i>G</i>	5		2							1		1
Store	<i>B</i> <i>G</i>	4			5			2					1
Boy Scout outfit	<i>B</i> <i>G</i>					2		2			5		1
Miscellaneous	<i>B</i> <i>G</i>	4 5	5	2 6	5 5	7 5	11 6	6 5	4 4	12 11	33 19	7 5	
No. cases	<i>B</i> <i>G</i>	26 37	37 36	48 48	43 41	45 44	47 72	53 57	48 47	41 28	9 16	397 426	

children the six ranking highest were, in order: bicycle, automobile, home, clothing, money, and a piano. The only two things not common to both lists are pony and piano. The two entire lists of wishes for both groups are very similar in makeup, the overlapping being great. Boynton gives 28 wishes which were mentioned by eight or more children. Twenty of these are also in the lists for the Negro children.

The lists for the Negro and white children are similar also in being almost entirely materialistic in nature. Health and education are the only abstract wishes given by the Negro children a sufficient number of times to warrant their inclusion. Even these include only 6 per cent of the total responses of the girls and 5 per cent of those of the boys, and are found to a greater extent among the upper age levels. The list for white children included three abstract wishes, health, happiness, and education. The three combined, however, made up only 6 per cent of the wishes of the boys and 8 per cent of the girls' wishes. It is interesting in this connection to note that in neither study did a child express a wish of a religious or spiritual nature. Although it is

possible that the materialistic nature of the responses is to some extent the function of the question used, the question was not such as to preclude a non-materialistic type of response.

When attention is turned toward the development of children's interests as related to chronological age, findings in general are again in line with those of Boynton's study. With the Negro children as well as the white some effect of chronological age upon interest in the bicycle may be discerned. With the Negro girls as well as the white, the bicycle appears to increase in popularity with advancing chronological age. A similar increase in interest is shown among Negro boys, however, a finding not true of the white group. Almost the reverse of this trend is true of the automobile. While the interest in the bicycle increases, interest in the automobile, very high in the sixth and seventh years, falls off rather sharply, although the decrease is not entirely consistent. The majority of the other 22 wishes listed appear to show little relation in their development to increasing chronological age. Exceptions to this are: toys, which are absent entirely with one exception after the eighth year; watch, which appears among the girls first at year 10 and

TABLE 2
PERCENTAGES OF CHILDREN EXPRESSING VARIOUS WISHES FOR EACH GRADE AND SEX

Wish	Sex	Grade						All
		I	II	III	IV	V	VI	
Bicycle	B	6	17	19	28	29	30	21
	G	2	7	16	40	26	32	22
Automobile	B	44	27	19	19	10	7	21
	G	29	21	11	5	13	6	13
Home	B	13	18	26	11	16	9	15
	G		15	9	16	15	14	12
Clothes	B	4	11	8	8	12	3	7
	G	20	19	11		5	2	8
Money	B	3	6	12	12	2	9	8
	G	2	4	5	9	6	3	5
Piano	B					2	1	1
	G	17	9	11	4	6	14	11
Education	B			3	3	6	13	4
	G					5	10	4
Radio	B	7	2	2				2
	G	5	7	7		2	1	3

TABLE 2 (*continued*)

Wish	Sex	I	II	Grade		V	VI	All
				III	IV			
Food	<i>B</i>	3	5	3	1	10		3
	<i>G</i>	2	1	2	4		10	1
Watch	<i>B</i>				2	5	3	4
	<i>G</i>							
Health	<i>B</i>				5		6	2
	<i>G</i>		1		2			1
Electric refrigerator	<i>B</i>				1			.3
	<i>G</i>	3	4	2	4	5		3
Furniture	<i>B</i>		2					.3
	<i>G</i>	3	1	11		2		2
Pony	<i>B</i>	6	2		1		4	2
	<i>G</i>	2		2				1
Toys	<i>B</i>	4	2					1
	<i>G</i>	7	1	2				1
Skates	<i>B</i>					2		.3
	<i>G</i>		3	3	5	2		2
Doll	<i>B</i>							
	<i>G</i>	2		7		2		1
Horse	<i>B</i>		2				1	1
	<i>G</i>	3						.2
Musical instrument	<i>B</i>	3	2	2	1		1	1
	<i>G</i>					2		.2
Airplane	<i>B</i>						4	1
	<i>G</i>				2			.2
Motorcycle	<i>B</i>		3	2			3	1
	<i>G</i>							
Telephone	<i>B</i>							
	<i>G</i>	3		2			1	1
Store	<i>B</i>	3	3	3				1
	<i>G</i>							
Boy Scout outfit	<i>B</i>					6	1	1
	<i>G</i>							
Miscellaneous	<i>B</i>	6		8	9	6	6	7
	<i>G</i>	3	7	3	7	6	5	5
No. cases	<i>B</i>	71	66	65	75	51	69	397
	<i>G</i>	59	70	58	55	62	122	426

from then on at every age level; and education, which except in one case is restricted to the age levels of 10 and above. This same general lack of relationship which may be observed with respect to age and the nature of wishes also appears when wishes are studied with respect to possible changes in the wishes expressed with increasing grade status. This may be seen in Table 2. The relationship of the majority of the wishes given to chronological age and to grade status, if present at all, would seem to be equivocal.

When the comparisons are made between the sexes, only two differences large enough to be statistically reliable were found, wishes for a piano and for a watch, both of which were expressed more often by girls than boys. The difference of 10 per cent between boys and girls in wishes for a piano is 6.3 times its standard error, and the difference of 4 per cent in wishes for a watch is 4.0 times its standard error. Another rather marked sex difference was shown in wishes for an automobile in which 8 per cent more boys expressed interest. This difference, being 2.9 times its standard error, may be said to be rather definitely reliable. Comparisons with Boynton's study again reveal similarities. With all three of the wishes which showed important differences among the Negro children statistically reliable differences were found among the white children. Of the 28 wishes of the white children studied, however, only six showed significant sex differences. The picture of sex differences among the Negro children as among the whites is one of small differences, with only the three of the 24 items already mentioned showing differences large enough to indicate with any reasonable certainty the presence of any influence other than that of chance sampling.

The specific wishes of the Negro children were further studied as they related to the economic status of the children concerned. It was originally planned to contrast the highest and lowest 25 per cent upon the economic scoring device. The actual division, however, was such that it included the highest 22 per cent and the lowest 29 per cent. In Table 3 are given the differences in the percentages of the children from the two economic groups expressing each wish. No single one of these differences was found to be statistically significant either in the case of boys, or girls, or of both sexes combined. In fact, only five of these differences were as great as twice their standard errors, a ratio which falls far short of the conventionally accepted criterion of statistical reliability. While it is true that the possible invalidity of the rating scale used may have obscured true differences that might have appeared between high and low groups, the consistent absence of significance is striking.

TABLE 3
PERCENTAGES OF CHILDREN OF HIGH AND LOW ECONOMIC STATUS EXPRESSING
CERTAIN WISHES

Wish	Boys		Girls		Both	
	High	Low	High	Low	High	Low
Bicycle	14	28	26	18	20	22
Automobile	16	18	9	13	13	16
Home	22	13	16	12	19	13
Clothes	4	4	5	13	5	10
Money	7	11	3	4	5	7
Piano		2	12	11	6	6
Education	9	3	6	3	7	3
Radio		4	2	4	1	4
Food	2	3		2	1	3
Watch			1	3	1	1
Health	4	2	1	1	3	2
Electric refrigerator	1	1	1	4	1	2
Furniture			6	2	3	1
Pony	4	1			2	.4
Toys	2	1			1	.4
Skates			2	4	1	2
Doll			3		2	
Horse		1				.4
Musical instrument		2	1	1	1	2
Airplane	2				1	
Motorcycle	1	2			1	1
Telephone			1	1	1	.4
Store		2				1
Boy Scout outfit						
Miscellaneous	11	4	4	6	7	5

In a further study of differences in interests concomitant with differences in chronological age, in sex, and in economic status, the wishes of the children were distributed into seven categories, the same seven selected by Boynton being used to render possible comparisons between the two studies. It is possible that in the two studies wishes were not in all cases classified in precisely the same manner according to category. Since most classifications, however, were relatively unequivocal, differences in classification were probably rare. The seven categories used were those of home, tools for play, travel and conveyance, animals, financial, personal, and educational. While such a classification may be arbitrary, it has value, as Boynton (2) points out, since more of the errors are likely to be compensatory and thus the element of chance in the samplings used will not wield so great an influence. The results of this redistribution of wishes are given in Table 4. In this table, as in Table 1, which gave the percentage distribution for the specific wishes, little relation can be seen between type of wish and chronological age. The cate-

TABLE 4
PERCENTAGE DISTRIBUTION OF WISHES ACCORDING TO THE SEVEN CATEGORIES FOR AGE GROUPS AND FOR HIGH AND LOW ECONOMIC STATUS

Type of wish	Sex	No. cases	Ages										Economic status			
			6	7	8	9	10	11	12	13	14	All	No. cases	High cases	Low	
Home	B	63	12	14	25	16	16	14	10	28	12	17	23	26	20	17
	G	113	24	28	35	27	23	29	30	22	36	28	34	36	33	29
Tools for play	B	102	24	6	27	19	36	30	27	34	34	27	16	18	40	33
	G	130	22	11	39	41	36	31	42	33	22	32	33	35	32	28
Travel and conveyance	B	92	42	54	23	35	22	18	12	11	20	24	18	20	24	20
	G	51	24	36	11	7	9	7	7	7	19	13	9	10	15	13
Animals	B	16	8	14	4	2			6	4	2	4	4	5	2	2
	G	2	3			2						1				
Financial	B	37	8	3	6	16	4	17	13	9	7	10	8	9	14	12
	G	41	5		2	12	14	14	7	22	19	10	5	5	9	8
Personal	B	54	4	9	15	12	18	16	19	11	20	14	14	16	17	14
	G	50	22	25	13	12	11	11	11	7		12	6	6	20	18
Educational	B	16	4				4	5	13	4	5	4	6	7	4	3
	G	15					5	7	4	11	4	4	6	6	3	3

gory of education is an exception since it appears at only one age level, year seven among boys, until year 10. It fails, however, to increase after this year with any consistency. Travel and conveyance appears to show a fair degree of relationship with chronological age, reaching its peak at year seven with both sexes and then declining rather sharply. This decrease, however, is not entirely consistent. These findings are again in general agreement with Boynton's which showed no consistent increase or diminution of interest in any of the seven categories except to a certain extent in educational wishes, which, as with the Negro children, were most frequent in the upper age levels.

When sex differences are studied as they relate to the seven categories, two types of wishes are found which show statistically significant differences between the two. The first of these is in wishes concerned with the home, which were given by 11 per cent more girls than boys. This difference is consistent at every age level except year 13. The second is in travel and conveyance, in which 11 per cent more boys than girls expressed an interest, and which appears at every age level, the difference varying in amount from 4 to 28 per cent. Statistically reliable differences were not observed with the other five categories of wishes. The finding concerning travel and conveyance is closely in line with Boynton's study in which a reliable difference of 10 per cent was found between boys and girls. The white children, however, showed no such difference between the sexes in wishes concerned with the home.

When the wishes of children of high and low economic status are considered, one finds that differences in categories, while present, are too small to be assigned confidently to anything other than chance. There is no single difference between boys of high and low economic status or between girls of high and low economic status which is as great as three times its standard error, and only two which are as great as twice their standard errors. It is the same picture of lack of relationship as that presented when the specific wishes are studied.

SUMMARY AND CONCLUSIONS

The findings given in the preceding paragraphs concerning Negro children's wishes when grouped into seven categories and the findings dealing with the specific wishes enable one to make some answer to the four questions proposed in this investigation. The four questions concerned the general nature of Negro children's wishes, interests as they relate to chronological and educational development, as they relate to sex, and as they relate to economic

status. The interests of Negro children as they are revealed by the technique employed are largely materialistic in nature. The six things most frequently wished for are: bicycle, automobile, home, clothes, money, and piano. These six responses cover almost three-fourths of the wishes expressed by both boys and girls. There appears to be little relationship between wishes expressed and either chronological age or grade placement. Exceptions to this are interests in a bicycle and in education, which increase, and interests in automobiles and in toys, which decrease. Where the seven larger categories are concerned, educational wishes show some rise, and travel and conveyance a fairly consistent decrease. The only significant sex differences in specific wishes are those for a piano and for a watch. Sex differences by categories show a significantly larger percentage of girls expressing wishes concerned with the home and a significantly larger percentage of boys expressing wishes having to do with travel and conveyance. Neither with wishes listed specifically nor with them grouped by categories are any reliable differences shown between children of high and low economic status as determined by the rating scale used.

A summary comparison of the present study with Boynton's study of white children would indicate certain differences appearing between the two groups. The more important of these probably are:

1. Negro children gave somewhat more wishes concerned with the home.
2. White children showed somewhat more interest in wishes for animals and specifically for a pony.
3. Negro children showed a higher interest in musical instruments and specifically in a piano. This interest was confined almost entirely to girls.
4. The Negro children showed somewhat less scattering of responses, the majority of them grouping their wishes around a slightly smaller list of items than did the white children.
5. The interest of the Negro child in an automobile and in the classification by categories in travel and conveyance appears to be more closely related in its gradual diminution to chronological age than it is in the case of the white child.

Yet more striking than such differences between the white and Negro groups is probably the basic similarity of the two groups, and the basic lack of relationship between the interests of these groups and the four factors studied of chronological age, grade placement, sex, and economic status.

This summary comparison of the studies of the interests of white children and Negro children from elementary schools of the Southern states would

appear to offer supporting evidence for the hypothesis suggested in the beginning of this analysis. This hypothesis was that, if the interests of children are dependent upon experiences peculiar to the individual rather than upon a natural or artificial group of which he is a member, differences between the interests of Negro and white children in the main would not be clearcut or consistent. It may be argued, in criticism of this hypothesis, that the lack of differences between the white and Negro groups compared in this analysis is attributable to the fact that a child's interests are based upon considerations which transcend the real or artificial group of which he is a member. In other words, there are many types of experiences common to all children existing together in a civilized state. In either case, it would seem that one is led to the view that a child's interests are dependent upon the particular experiences through which he as an individual has passed. This interpretation of the findings of the present study, if it possesses any validity, would lead inevitably to the conclusion that the interests of a child cannot be determined through a study of the group of which he is a member by reason of age, sex, educational status, economic level, or race; instead, such interests can be predicted only in light of the particular and individual factors of the child's past and present environment.

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THE VOCATIONAL PREFERENCES OF NEGRO SCHOOL CHILDREN*

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The purpose of the present study has been to investigate the vocational preferences of Negro school children from certain communities which may be considered as fairly representative of the South.

The few studies of the vocational interests of Negroes which may be found in the literature at the present time have been concerned largely with the high school and adult levels. The present investigation was undertaken with the belief that a study of the vocational wishes of the younger Negro child might yield findings of some interest since the younger child probably has come less into contact with the social and economic barriers erected around some occupations he might choose than has his older brother or sister. It was also believed that in a study of the younger child general trends in the development of vocational interests with increasing chronological age might be revealed. In addition, the writer felt that a comparison of the expressed vocational preferences of Negro children with those of white children from similar communities might be of value in indicating to some extent the origin of vocational interests.

The specific questions which the present investigation has attempted to answer with respect to the vocational preferences of Negro children are as follows:

1. What occupations are most favored by Negro boys and girls of elementary school age?
2. Are these occupational preferences related to the chronological ages of the individuals studied?
3. In terms of the Taussig classification, what are the occupational levels of the vocations listed by the children?
4. Are the occupational levels chosen related to the ages of the children?
5. How do the vocational preferences of these children compare with those of a group of white children of the same age and from similar communities?

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METHOD

The 797 children studied in this investigation were enrolled in the first six grades of a large elementary school of Nashville, Tennessee, and two smaller Negro elementary schools in Franklin, Tennessee, and Burlington, North Carolina. The following question was asked each child:

When you get old enough to leave home and make a living for yourself, what kind of work do you want to do? For example, you might want to be a carpenter, a school teacher, get married and keep house, be a farmer, be a doctor, run a boarding house, work in a beauty parlor, or just any one of a whole lot of things. Put down the ONE thing you would rather do than anything else when you get old enough to make your own living.

In the first three grades, the teacher asked the question to each child separately. In the upper three grades, the children read the question as presented upon a sheet of paper and recorded their own responses.

It is possible to criticize such a method as yielding results that may be partially invalidated because of the influence upon the responses of passing whims of the children. It is difficult, however, to devise other methods of reaching the vocational preferences of the child than those of direct questioning, especially when one wishes to study a fairly large population sampling. Furthermore, while the influence of a passing fancy may have served to invalidate a given single response, the responses of the total group probably have sufficient validity to justify their analysis.

RESULTS

The responses of the children were analyzed first according to the specific occupation chosen. The results of this analysis are given in Table 1. Among the boys studied, four occupations stood out rather markedly above all others. These four, in order, were: doctor with 65 choices, farmer with 55, carpenter with 47, and teacher with 33. Together these included 50 per cent of all the vocational wishes of the boys and are the only ones mentioned more than 11 times by the entire group of 392 boys. The remaining 22 occupations which were listed by as many as four boys represent a fairly wide scatter of interests. Only three of these, however, would receive an occupational rating of higher than that of skilled labor according to the Taussig classification.

Of the four occupations listed most frequently by boys, only one appears to bear any relationship to advancing chronological age. This is the occupation of teacher, more favored by older than by younger boys. The occupations of doctor, farmer, and carpenter, the three most favored, show no

TABLE 1
PERCENTAGE DISTRIBUTIONS OF THE VOCATIONAL WISHES OF BOYS
ACCORDING TO AGE

Vocation	No. cases	6	7	8	9	10	Ages 11	12	13	14	All
Doctor	62	12	5	28	14	7	17	24	10	20	16
Farmer	53	23	11	19	16	11	15	6	16	10	14
Carpenter	48	8	8	10	16	13	10	9	18	15	12
Teacher	33		5	2	7	13	8	13	12	10	8
Taxi driver	11	8	5	8	2		2		2	2	3
Musician	10					4	6	4		7	3
Preacher	10	15	8		2	2	2				3
Policeman	9	4	5	5	5	2	2				2
Mechanic	8		8			2			4	2	2
Lawyer	7		3	5	5	2		2			2
Postman	7						4	2	6	2	2
Factory worker	7	11		2	4						2
Miner	7				7	2	2	2	2		2
Merchant	7			2	2	2		4	4		2
Truck driver	6			3	2		2	4		2	2
Sailor	4						2	4		2	1
Pullman porter	4		2	5		2					1
Porter (general)	4	2					2		4		1
Keep house	4		3				4	2			1
Plasterer	3							4		2	1
Chauffeur	3		3		4						1
Keep board. house	3							2	2	2	1
Beautician	3					2		2	2		1
Launderer	2	4							2		1
House boy	2	4						2			1
Cook	1	2									0.3
Miscellaneous	74	23	24	10	19	24	19	13	18	24	19

consistent increase or diminution with age. Examination of the other occupations listed less frequently yielded somewhat similar results, and where changes were shown, as in the occupations of preacher, postman, and policeman, the number of cases was too few to justify generalizations.

When attention is turned to the data for the girls, one is struck immediately by the very narrow range in which the vocational wishes of the Negro girl lie. As may be seen in Table 2, the four occupations of teaching, nursing, beauty parlor work, and domestic service account for four-fifths of the occupational choices of all the girls. Teaching alone accounts for one-third of the group. This marked preference for teaching is consistent throughout the range of ages studied, ranking first at every age, except one, from six to

TABLE 2
PERCENTAGE DISTRIBUTION OF THE VOCATIONAL WISHES OF GIRLS
'ACCORDING TO AGE

Vocation	No. cases	Ages									
		6	7	8	9	10	11	12	13	14	All
Teacher	136	32	22	40	41	25	29	39	38	29	34
Nurse	90	19	33	25	10	20	21	19	28	25	22
Beautician	60	13	6		7	14	18	25	21	29	14
Domestic service	51	27	28	19	22	9	11	2	2		14
Housewife	21		6	4	10	14	3	5	2	4	5
Music teacher	10			4		5	6	2		4	2
Stenographer	8					7	6			4	2
Seamstress	6					2	1	4	4		2
Keep board. house	4		3		2			4			2
Merchant	5	3		4			1		2		1
Laundress	3	5			2						1
Musician	2						2	2			1
Miscellaneous	9		3	2	5	5	1		2	4	3

14. Neither teaching nor nursing appears to bear any clearly discernible relationship to chronological age. Beauty parlor work, on the contrary, does appear to increase in favor as one goes from the lower to the upper age levels. Domestic service, which is in the second place at year six declines sharply after year nine. There were three occupations, mentioned less frequently by girls, which appear to be more favored by the older girls. These are music teaching, which appears only twice before the tenth year and eight times thereafter, and stenographic work and sewing, neither of which appears before the tenth year. The numbers, however, are so small as to make any definite conclusions concerning possible relationships hazardous.

When one compares the choices of boys and girls, probably the most striking difference is in the much smaller range of occupations found in the girls' list. For the 405 girls, all except 9 scattered responses might be grouped into 12 categories. With the boys, however, 26 separate occupations were listed as chosen by four or more individuals. All occupations listed by less than four of the entire group were arbitrarily classified as miscellaneous, and into this miscellaneous group fell 19 per cent of the choices of the boys.

Another phase of the vocational wishes of children which this study has proposed to investigate is that of the occupational rating, according to the Taussig classification, of the occupations preferred by the subject population, and the possible relationships between levels of occupational choice and chronological age.

The occupational preferences of the children were assigned ranks from one, unskilled labor, to five, professional work, in accordance with the five steps of the Taussig scale. The median occupational levels chosen by girls and boys are given in Table 3. With boys the median occupational level was found

TABLE 3
MEDIAN RATING OF VOCATIONAL WISHES BY TAUSSIG'S SCALE

Sex	Ages									
	6	7	8	9	10	11	12	13	14	All
Boys	3.14	2.88	3.30	3.13	3.24	3.37	4.62	3.12	3.32	3.23
Girls	3.69	3.67	4.32	3.87	3.75	4.05	4.09	4.14	4.00	4.00

to be 3.23, a figure falling within the classification of skilled labor. Thirty-eight per cent expressed preferences for occupations falling within the two upper Taussig groups of professional and semi-professional work and only 17 per cent for the two lower Taussig groups of unskilled and semi-skilled labor. This may be seen in Table 4. No consistent rise or fall is shown with

TABLE 4
PERCENTAGES OF BOYS AND GIRLS EXPRESSING CHOICES FALLING WITHIN EXTREME VOCATIONAL GROUPS

Groups	Sex	Ages										All
		6	7	8	9	10	11	12	13	14		
Professional and semi-professional	Boys	33	22	41	33	36	44	55	28	44	38	
	Girls	45	55	75	54	59	66	61	69	65	62	
Semi-skilled and unskilled labor	Boys	21	32	15	21	11	13	12	15	19	17	
	Girls	35	33	19	29	11	11	5	2		16	

increasing age as to the number of choices falling within the two upper groups, although interest in the two lower groups declines rather sharply after year nine.

The median Taussig rating for all girls was 4.00. Sixty-two per cent evinced interest in the two upper Taussig groups and only 16 per cent in the two lower Taussig groups. The median Taussig rating for girls appears to bear a low but fairly consistent relationship with age, increasing from 3.69 in year six to 4.00 in year 13. As Table 4 shows, little relationship is seen between chronological age and interest expressed in the professional and semi-professional groups. Interest in the unskilled and semi-skilled labor groups, however, shows a marked and consistent decline, falling from 35 per cent in year six to zero per cent in year 14.

A striking sex difference is seen here in the number of cases expressing

preferences falling into the two upper Taussig groups. Twenty-four per cent more girls than boys express occupational choices falling into these groups, a difference so large as to indicate considerably less than one chance in a thousand that the difference is explicable in terms of chance alone. This difference is consistent throughout the entire range studied. The percentages for the two lower groups, however, were almost identical, 16 per cent for girls and 17 per cent for boys.

Comparison of the results of this study with an analysis made by Boynton (2) with white children, a study in which substantially the same technique of investigation was used, yields several points of possible interest. The preferences of Negro and white girls appear to be strikingly similar, the three occupations of teacher, nurse, and beautician making up from two-thirds to three-fourths of all choices with both groups. The findings with boys, however, are less similar. With white boys the four most favored occupations were: farmer with 18 per cent, and pilot, mill or plant worker, and doctor, each of the last three being mentioned by 9 per cent of the group. The first four among the Negro boys include two of these, doctor with 16 per cent and farmer with 14 per cent. Pilot is mentioned by less than 1 per cent of the Negro children and mill worker by only 2 per cent. This last difference is possibly explicable in terms of specific environmental influences, since a larger number of Boynton's children came from industrial towns. Teacher, which 8 per cent of the Negro boys selected, was mentioned by only 2 per cent of the white cases.

When the white and Negro children are compared with respect to the median occupational level chosen, with a considerable degree of consistency the median occupational level chosen by the Negro children is higher than that of the white children. For the total group the median occupational level of the boys was 3.23, a figure 0.89 points higher than the median occupational level of the white boys. The Negro girls' median of 4.00 was 0.81 points higher than the corresponding median of the white girls.

By way of summary, then, it would appear that the vocational choices of Negro school children of the first six grades tend to fall into a rather small number of classifications; that teaching is the most favored occupation with girls and medicine with boys; that the median occupational level chosen is high, skilled labor for boys and semi-professional work for girls; that the Negro girls' preferences are essentially similar to those of the white girls; that the interests of the Negro and white boys are somewhat dissimilar, the Negro boy evincing rather more interest in certain professional occupations;

that the median occupational level chosen by the Negro child on a five point scale is almost one point higher than the white child's.

DISCUSSION

It would appear that the vocational preferences of both boys and girls, white and Negro alike, tend on the whole to follow rather conventional patterns. For the United States at large, the Dictionary of Occupational Titles published by the Department of Labor lists over 17,000 different occupations. And yet the old nursery rhyme of "doctor, lawyer, merchant, chief," is not a more circumscribed list of occupations than the choices of these children. Eighty per cent of the Negro boys list occupations which fall into but 26 separate groups, while it is possible to allocate the choices of 97 per cent of the girls into only 12 different occupational categories. These findings become particularly significant when one considers that many of the occupations listed by these Negro children are highly competitive pursuits, entry into which is difficult and success in which is often doubtful. In professional and semi-professional work the Negro is probably at a considerable disadvantage in securing employment. A survey made by the United States Employment Service (1) in 1939 indicates that the relative placement rate during the preceding year of Negro professional, semi-professional, and technical workers registered with the United States Employment Service was only 14 per cent and 1.6 per cent for men and women respectively as compared to 47 and 22 per cent for white men and women. This relative placement rate is found by calculating the proportion of registrants from a particular occupational, sex, and color group for whom employment would be secured if employment were equitably distributed according to the proportion of registrants in such groups. One hundred per cent for a group, then, would indicate that the number of people employed from that group was exactly the number that might be expected if employment were equitably distributed. Indication is thus given that even with the white worker chances of employment in professional and semi-professional work are relatively poor, and that with the Negro worker chances of employment are considerably less.

Furthermore, if the data presented in this study have any validity, the Negro child is not becoming more realistic in his vocational choice with increasing chronological age. Rather, the indication of this study, where occupational levels are seen to become slightly higher with increasing age, is that the child is becoming not more, but rather less, realistic in his vocational choices.

Another outcome of some importance in this investigation is the finding that the median occupational level chosen by the Negro child is almost one point higher on the Taussig scale than that chosen by the white child. One can only conjecture as to why this should be true. It may be possible that the Negro child is simply more conventional than the white child, or that he is less realistic in his choice of a vocation. On the other hand, it is possible that the Negro child has a greater interest in economic security than the white child. It may be that this divergence is explicable in terms of the Negro child's striving for a prestige that members of his race have achieved but seldom in our present society. Whatever is its cause, the higher median rating of the Negro child certainly raises a question when one considers that only 2 per cent of gainfully employed Negroes are classified as professional, and that three-fourths of those so classified are either teachers, clergymen, or musicians. The profession of medicine was chosen by 16 per cent of the Negro boys studied, and yet only 0.06 of 1 per cent of all Negroes gainfully employed are listed as either physicians or surgeons (3).

The fact that the occupational choice of the Negro child is so very far from the type of work in which it is likely that he may find employment would appear to be of considerable significance. Not only will such a discrepancy between occupational choice and possible realization have its impact upon the future adjustment of the individual concerned but upon that individual's community as well and upon society at large. There would appear to be a greater need of realism concerning vocational aims and preferences both upon the part of the child and of those with whom he comes in contact. Also, there is strong indication that somewhere in the child's experience there should be a much broader acquaintance than at present with the many possible vocations into which a person may enter.

Finally, there would appear to be certain implications in the finding that the Negro child is consistently choosing vocations with a higher occupational rating than is the white child. If the Negro child's choice of higher occupational levels is a function of his greater striving for economic security and prestige, it would seem to indicate that social readjustment sufficient to grant such security and prestige is desirable for the happiness and welfare of the Negro child. The higher median occupational level chosen by the Negro child would also suggest that with the Negro child, to an even greater extent than with the white child, a different type of emphasis in education is to be desired. As Witty (4), in a recent discussion of discrepancies between vocational ambitions and probable future employment of high school stu-

dents, has pointed out, probably less stress should be placed upon acquisition and achievement, power and prestige, as the desirable ends of human endeavor. It is possible that the solution to the problem of a more desirable emphasis in the education of the child may lie in a greater stressing of types and qualities of human relationships as being of primary importance in the satisfactory adjustment of the individual to the society in which he lives.

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THE CAUSATION OF FRATERNAL RESEMBLANCE*

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I have records of 409 pairs of brothers (plus four pairs of half-brothers, not used in this investigation), students at Columbia College, consisting of height, weight, age at entrance to college, and score made at or near the time of entrance in the Thorndike *Intelligence Examination for High-School Graduates*.

I have used these to compare the amount of resemblance in traits little subject to home environment with that in traits more subject to it. Weight is presumably more subject to home environment than height is; and age at entrance to college is subject to parental wealth and pressure to do well in school more than test-score is.

HEIGHT

We correct the actual heights to probable values at age 19 and later by adding 4 inches to those of age 15.1 or 15.2; 3½ inches to those of age 15.3 or 15.4; 3 inches to those of age 15.5 or 15.6; 2½ inches to those of age 15.7, 15.8 or 15.9; 2 inches to those of age 16.0, 16.1 or 16.2; 1½ inches to those of age 16.3, 16.4 or 16.5; 1 inch to those from 16.6 to 16.9; and ½ inch to those from 17.0 to 17.4.

Table 1 shows the fraternal resemblance of the Columbia brothers in stature so corrected. They are obviously a selected group with a mean stature of 69.25 inches and with about three quarters of them above the mean of the general adult male population, which is 67½ inches.² The

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²According to the monumental work of Davenport and Love (*The Medical Department of the United States Army in the World War*, vol. XV, Statistics, 1921), the mean stature of the general male population of the United States draft in the first World War was 67.49 inches. The means for New York, New Jersey, and Connecticut were 66.72, 66.77 and 66.71 respectively. The corresponding standard deviations were 2.71 inches for the entire draft and 2.66 for the New York urban area, 2.66 for the New York eastern manufacturing region, 2.76 for the New

TABLE 1
DOUBLE-ENTRY CORRELATION TABLE OF HEIGHTS OF BROTHERS AT AGE 19, IN INCHES: 61 = 61.0 IN. TO 61.4 IN.; 61.5 = 61.5 IN. TO 61.9 IN.; 62 = 62.0 IN. TO 62.4 IN.; 62.5 = 62.5 IN. TO 62.9 IN.; ETC.

	76.5	76	75.5	75	74.5	74	73.5	73	72.5	72	71.5	71	70.5	70	69.5
76.5															
76						1						1			
75.5									1				1		
75				2						1				2	
74.5							2				1			1	
74		1								1	1	1	2	1	
73.5										2	5	1	4	1	1
73										5	2	3	1	1	1
72.5					2			1			1	4	2	1	2
72					1	3		2		1	4			4	3
71.5					1	1		5		2		8	5	3	3
71					1	1		1		4		5	6	3	3
70.5		1			2	1		4		1	4	3	3	4	9
70					2	1		1		2	3	3	3	9	10
69.5					1	1		1		3	1	4	4	6	8
69						1		2		2	2	3	2	4	6
68.5						2		1		3		4	8	4	3
68								4			2	4	4	1	3
67.5				1				1		3		5	2	5	2
67						1			2		1		1	1	
66.5								1							
66								2							
65.5															
65															
64.5															
64															
63.5															
63															1
62.5															
62															
61.5															
61															
60.5	3	0	1	5	11	12	10	27	23	30	29	51	52	56	66

Pearson correlation computed by using deviations from their own mean is .50, but that computed by using deviations from 67.75 is .60.

Using 67.75 as the mean for the general population and using the means of the 12 Columbia arrays under 76.5", 76.0", 75.5", . . . 71" as means of the arrays of all brothers of persons 76.5", 76", 75.5" . . . 71", we have values of the fraternal correlation in the general population as follows:³

By the array under 76.5, $n = 3$, $r = .43$
By the array under 76.0, $n = 0$
By the array under 75.5, $n = 1$, $r = .56$
By the array under 75.0, $n = 5$, $r = .59$
By the array under 74.5, $n = 11$, $r = .44$
By the array under 74.0, $n = 12$, $r = .55$
By the array under 73.5, $n = 10$, $r = .63$
By the array under 73.0, $n = 27$, $r = .48$
By the array under 72.5, $n = 23$, $r = .80$
By the array under 72.0, $n = 30$, $r = .80$
By the array under 71.5, $n = 29$, $r = .73$
By the array under 71.0, $n = 51$, $r = .70$

The average is .61 if we give equal weight to each array; it would be .67 if we gave weights in proportion to n , but that is not desirable because, other things being equal, the arrays most remote from the general mean should have the most weight. Weighing each array by \sqrt{n} we have .60 as the average r .

An independent estimate of the fraternal correlation for stature in the general population may be made by comparing the variability of an array of Columbia brothers with the variability of the general population, and using

$$\frac{\text{var. of an array}}{\text{var. of the gen. pop.}} = \sqrt{1 - r^2}.$$

The estimate from the reduction of the variability of an array is .52.⁴ It is .523 from arrays for 68½ inches or higher, and .515 from arrays for

York suburban territory, 2.77 for the New York urban area, 2.74 for the New Jersey densely populated area and 2.68 for the Connecticut near-metropolitan area. Rountree found 67½ inches as the average for 2,000,000 examined for the present draft. Those accepted were probably a bit taller (*Science*, vol. 94, p. 552 f).

³The assumption that the resemblance of the 409 pairs of Columbia brothers in stature will equal the resemblance of brothers in the general population is not fully justifiable. Stature has a slight positive correlation with intelligence, so that if tall boys have dull brothers unable to enter college, the dull brothers will be somewhat shorter than the brighter brothers who do go to college. But the influence of the correlation between stature and intelligence is surely very slight.

⁴I compute the SD 's of the successive arrays from a series of smoothed means, 72½" for the array under 76½, 72 for the array under 75½ and 75, 71½ for the arrays under 74½ and 74, 71 for the arrays under 73½ to 72, and so on. If the actual means had been used, the estimated r would have been higher, of course.

68 inches to 64 inches. The standard deviations in arrays for 64 inches or less vary according to how the means are smoothed, but a reasonable treatment of them gives $r = .52$. There are so few cases in these arrays that any reasonable estimate will not alter the general estimate of .52 by the reduction of the variability.

The fraternal correlation for stature by our data may then be set as .56. This is somewhat above the figures of Pearson and others. But the populations used by them may have been selected from the upper levels, economic and intellectual, of the population.

WEIGHT

I correct the weights to probable weights at age 19.0 as given in Table A.

TABLE A

Age	Add	Age	Add	Age	Add	Age	Add	Age	Subtract
15.0	32 lb.	16.0	19 lb.	17.0	9 lb.	18.0	4 lb.	19.0 to 19.9	2 lb.
15.1	30 lb.	16.1	18 lb.	17.1	9 lb.	18.1	4 lb.	20.0 to 20.9	3 lb.
15.2	28 lb.	16.2	17 lb.	17.2	8 lb.	18.2	4 lb.	21.0 or >	4 lb.
15.3	27 lb.	16.3	16 lb.	17.3	8 lb.	18.3	3 lb.		
15.4	25 lb.	16.4	15 lb.	17.4	7 lb.	18.4	3 lb.		
15.5	24 lb.	16.5	14 lb.	17.5	7 lb.	18.5	3 lb.		
15.6	23 lb.	16.6	13 lb.	17.6	6 lb.	18.6	2 lb.		
15.7	22 lb.	16.7	12 lb.	17.7	6 lb.	18.7	2 lb.		
15.8	21 lb.	16.8	11 lb.	17.8	5 lb.	18.8	1 lb.		
15.9	20 lb.	16.9	10 lb.	17.9	5 lb.	18.9	1 lb.		

The fraternal correlation table is shown in Table 2.

The average weight at age 19.0 of the general male population whence these brothers are drawn may be set at 139.5. The average for the draft in 1917-18 for New York, New Jersey, Connecticut, and Pennsylvania was 139.5. The average for the draft in the present war is eight pounds heavier according to Rountree. The average at age 19.0 would be less than that for the same persons at the draft ages. Using deviations from 139.5, the correlation is .41.⁵

We may check this correlation of .41 by using the variabilities of the arrays. The standard deviation of the general male population at age 19.0 is almost certainly not over 17.42 lb., the figure for the draft in the first world war.

⁵The mean corrected weight at age 19.0 of the Columbia brothers is 143.4. If the mean weight of the general population at age 19.0 is higher than this, the correlation will be lower (about .40 for 140.5, .39 for 141.5, and .38 for 142.5). If the mean weight of the general population is lower, the correlation will be higher (about .44 for 138.5 and .45 for 137.5).

The standard deviations of the arrays, deviations being taken from smoothed means, are as given in Table B.

TABLE B

Array	Smoothed mean	N	Standard deviation
Under 93-101 lb.	124.5	4	21.20 lb.
Under 102-110 lb.	127.5	11	22.35 lb.
Under 111-119 lb.	130.5	54	13.32 lb.
Under 120-128 lb.	133.5	100	16.27 lb.
Under 129-137 lb.	139.5	151	16.05 lb.
Under 138-146 lb.	141.5	172	15.15 lb.
Under 147-152 lb.	145.5	104	13.83 lb.
Under 153-161 lb.	148.5	112	19.53 lb.
Under 162-170 lb.	151.5	63	13.59 lb.
Under 171-179 lb.	154.5	24	12.21 lb.
Under 180-188 lb.	157.5	13	19.77 lb.
Under 189-197 lb.	160.5	4	12.45 lb.
Under 198-206 lb.	163.5	4	23.80 lb.
Under 207-215 lb.		0	
Under 216-225 lb.	169.5	2	51.00 lb.

The average of these (weighted by the numbers in the arrays) is 16.12, which would correspond to a correlation of .38. But if we omit the arrays for 180 or over, which may be unduly influenced by our process of correction, it is 15.84, which corresponds to a correlation of .42.

Since the 17.42 lb. is an outside estimate for the variability of the general population at age 19.0 we may be confident that the fraternal resemblance of all brothers in that population is as likely to be under .41 as above it, and has only one chance in 700 of exceeding .50.

INTELLIGENCE-TEST SCORE

We have two measures of "intelligence," the actual score made in the Thorndike *Intelligence Examination for High-School Graduates* a few days (or sometimes a few months), before the time of entrance, and an estimated score if the person had taken the test at age 17.75 years. The latter is computed from the actual score by adding amounts for the younger and subtracting amounts for the older by the scale given in Table C.

We wish to know what the fraternal correlation would be in a random sample of the general population tested with the Thorndike examination at age 17.75 years. We may use our data to estimate this in two ways. The first is to estimate the mean Thorndike score for such a random sample and to compute the regression toward it of the brothers of persons scoring

TABLE C

Age at entrance	15.1-15.2, add 7.0 to the Intelligence Score
Age at entrance	15.3-15.4, add 6.0 to the Intelligence Score
Age at entrance	15.5-15.6, add 5.5 to the Intelligence Score
Age at entrance	15.7-15.8, add 5.0 to the Intelligence Score
Age at entrance	15.9-16.0, add 4.5 to the Intelligence Score
Age at entrance	16.1-16.2, add 4.0 to the Intelligence Score
Age at entrance	16.3-16.4, add 3.5 to the Intelligence Score
Age at entrance	16.5-16.6, add 3.0 to the Intelligence Score
Age at entrance	16.7-16.8, add 2.5 to the Intelligence Score
Age at entrance	16.9-17.0, add 2.0 to the Intelligence Score
Age at entrance	17.1-17.1, add 1.5 to the Intelligence Score
Age at entrance	17.3-17.4, add 1.0 to the Intelligence Score
Age at entrance	17.5-17.6, add 0.5 to the Intelligence Score
Age at entrance	17.7-17.8, add 0 to the Intelligence Score
Age at entrance	17.9-18.0, add 0 to the Intelligence Score
Age at entrance	18.1-18.2, subtract 0.5 from the Intelligence Score
Age at entrance	18.3-18.6, subtract 1.0 from the Intelligence Score
Age at entrance	18.7-19.0, subtract 1.5 from the Intelligence Score
Age at entrance	19.1-19.6, subtract 2.0 from the Intelligence Score
Age at entrance	19.7-20.6, subtract 2.5 from the Intelligence Score
Age at entrance	20.7-21.6, subtract 3.0 from the Intelligence Score
Age at entrance	21.7 or over, subtract 3.5 from the Intelligence Score

115, or 114, or 113, or any other very high score from the observed regression in the Columbia brothers. The second is to estimate the variability for such a random sample and to compute the reduction from it in the variability of arrays of Columbia brothers for scores of 115, 114, 113, . . . 95.

It may be assumed that if we had every brother of those scoring 95 or higher in the Thorndike examination instead of only those who entered Columbia, the mean score and the variability for them all would differ little from the mean score and variability for those who did enter Columbia. This assumption was checked as follows:

There were 88 families in the group having one or more brothers scoring 95 or higher in the intelligence examination. With the coöperation of the Columbia Alumni Federation, the following request probably reached 77 of them, of whom 76 replied.⁶

Have you any brothers besides
 If so, please give the following facts for each of them:
 First name and middle initial
 Year of birth
 Did he graduate from high school?
 If so, in what year?
 Did he enter college?
 If so, what college?

⁶No good address was available for six, and the letters for five more were returned to me by the postal authorities.

Of these 76 families, 55 had no other brothers than those in my records, 21 had 25 brothers, 16 years old or older at the time of writing, besides those in my records. All of these 25 save one graduated from high school; all save four entered college; all save five graduated from high school before the age of 19.

Unless the one who failed to reply and the 11 who were not reached had brothers not on my list who were duller than the 25 reported by the 76 who replied, we must conclude that almost every brother in a fraternity containing one scoring 95 or higher, might have gone to Columbia so far as intellect was concerned, and that if all the brothers in these 88 families had taken the Thorndike examination at age 17.75 the means would have been only a trifle lower than the mean for our selection from them and the variability in each array would have been only a trifle greater than the variability for our selection from them.

If all males aged 17.75 in the general white population did the best that they could with the Thorndike examination, the mean score would probably be near 50. For there was a substantial percentage of high-school graduates in 1920 to 1930 scoring below 50, and the 5 percentile of high-school graduates of those years was near the 50 percentile of the total population of their age. Lorge found the following equivalents in a group of 80 adults all tested with *CAVD*, Army Alpha, Thorndike, Otis and other tests: Thorndike, 52.1 is equal to Army Alpha, 128.0, and to *CAVD*, 400, and to Otis *A*, 42.4, and to Otis *B*, 32.3. By these equivalents Thorndike 52 represents a point above the mean ability of persons of age 17.75.

The standard deviation of Thorndike Examination scores of all white males at age 17.75 may be estimated as at least 20.0. The upper range surely extends past 115 and we may reasonably expect that $1\frac{1}{2}$ persons per thousand of that age would score 113 or higher. The low range surely extends below zero, in the sense that the idiots and imbeciles would have to improve considerably to make any positive score in this examination. The standard deviation for the 80 W.P.A. adults measured by Lorge is about 21, a stretch of 49 being required to include 70 per cent ($2.08 SD$), a stretch of 54 being required to include 80 per cent ($2.56 SD$), and a stretch of 59 to include 90 per cent ($3.29 SD$). Robert Thorndike has found with a vocabulary test that the standard deviation of the Gallup-poll sample is twice that of Columbia and Barnard students. The standard deviation for Columbia College Entrants is at least 12. It is 14.2 for our group of brothers using the score corrected for age at entrance, but this may be a

little high because of spurious variation introduced by the corrections. It is 11.6 if the uncorrected scores are used, but this is surely too low because the uncorrected scores of the younger and brighter pupils are reduced unduly toward the mean, and those of the older and duller are raised unduly toward the mean. These facts support the estimate of 20 as a minimum for the standard deviation of the general male population at age 17.75.

Using 53 as the mean score of the general population at age 17.75 and the means of the arrays of Columbia brothers under scores of 95 or higher as the means of the arrays of brothers in the general population under similar scores, we compute seven estimates of the correlation as follows:

Array under 95-98; $n = 59$, $r = .80$
Array under 99-102; $n = 23$, $r = .90$
Array under 103-106; $n = 30$, $r = .78$
Array under 107-110; $n = 18$, $r = .70$
Array under 111-114; $n = 15$, $r = .67$
Array under 115-118; $n = 6$, $r = .65$
Array under 119-122; $n = 2$, $r = .59$

Weighting each array equally the average of the seven is .73. Weighting each by the square root of the number of brothers in the array the average is .76. Even if the mean score for the general population is set as high as 60, the corresponding average correlations are .69 and .72.

The variability of each of the arrays in the double-entry correlation table for intelligence-test score corrected for age was as shown in Table D.

TABLE D

Arrays	N	Smoothed means	SD
Under 95-98	59	89.0	13.5
Under 99-102	23	89.0	13.8
Under 103-106	30	93.0	12.7
Under 107-110	18	93.0	14.5
Under 111-114	15	97.0	15.1
Under 115-118	6	97.0	16.0
Under 119-122	2	101.0	

If the standard deviation of the general population at age 17.75 is set at 20, the correlations inferred from these variabilities are in order .74, .72; .78, .68, .65, and .61. They have an average of .71 if weighted equally and an average of .73 if weighted by the numbers in the arrays. The latter seems a much sounder weighting here. If the standard deviation for the general population at age 17.75 is 22, as it may well be, the correlation estimated from the variability of the arrays would be, not .71 or .73, but .73 or .76.

According to the figures set for the mean and variability of the general population, and the weights attached to the arrays, we have eight correlations of .69, .71, .72, .73, .73, .73, .76, and .76. The average of these, .73, is a reasonable estimate of the fraternal resemblance in score in the Thorndike examination at age 17.75.

A fraternal correlation of .73 for intelligence-test score is much higher than most of those that have been reported, but is in accord with results of Outhit, Raymond Cattell, and the writer. I have summarized their results elsewhere.

Previous workers in this field have given too little consideration to the influence of a narrowed range of selection of persons, and to the influence of attenuation by the inadequacy of the tests to measure all of intellect and nothing but intellect.⁷ If in our Columbia group we had used deviations from the mean score of the group the correlation would have been .41, instead of .73. Those studies which cover fairly the whole range find fraternal correlations of .50 or more, using the Stanford-Binet or some standard group test. Correction for attenuation would raise the .50 or more to .55 or more. The discrepancy between this .55 or more and the .70 or more of the present study may be due to the fact that the Thorndike Examination given at college entrance includes the influence of the environment over a longer time and makes no effort to emphasize native rather than acquired abilities.

AGE AT ENTRANCE TO COLLEGE

The two procedures in estimating the fraternal resemblance in the age at entrance to college are in general the same as those used for Thorndike score, but the facts are more complex and less certain. The mean age at entrance for the general male population if all tried to get into Columbia may be set at 20.5 years, it being understood that most of those who did not get in at or before age 20.5 could never get in. Probably over half of the general male population could never get admitted to Columbia College, no matter how much their parents spent for schools and tutors. The standard deviation of age at entrance to Columbia may be set at 1.8 years for the

⁷Even the Thorndike Examination, which takes three hours and which a candidate who has any good reason is allowed to repeat (using a different form of the examination), has a self-correlation under .95, so that our .73 is, in so far forth, three points low. This reduction of three points I have left as an offset to the possible influence of the five omitted brothers who did not graduate from high school until 19 years of age.

top half of the general population in this respect since there are actually entrants at age 15.1 or younger ($20.5 - 15.1 = 5.4$, which equals 3 times the standard deviation of the upper half). The standard deviation of the bottom half is undetermined. The variability of an array of all brothers of persons who entered at 15.1, or at 15.2, or at any age up to 16.9 may be assumed to be little greater than the variability of an actual array of the Columbia brothers of entrants at these ages. There would doubtless be an occasional brother in the general array who was long delayed by economic conditions, or invalidism, etc., or who did not enter at all. But as a rule, if one brother in a family enters college as young as 15.1 to 16.9, his brothers may be expected to enter college with few exceptions, and to vary from his entrance-age not much more than the Columbia brothers of such a young Columbia entrant vary from his.

The facts for Columbia brothers of young Columbia entrants are presented in Table 3. The means and standard deviations of the five arrays are as given in Table E.

TABLE 3
AGE AT ENTRANCE TO COLLEGE OF ALL COLUMBIA BROTHERS OF BOYS ENTERING BEFORE
16.9 YEARS

	15.1-15.2	15.3-15.6	15.7-16.0	16.1-16.4	16.5-16.8
15.1-15.2		1		1	
15.3-15.4	1			2	
15.5-15.6			2	2	3
15.7-15.8		1	1	1	
15.9-16.0		1	3	2	1
16.1-16.2		3		3	2
16.3-16.4	1	1	3	5	7
16.5-16.6		2	1	5	8
16.7-16.8		1		4	8
16.9-17.0			1	4	5
17.1-17.2	2		3	2	4
17.3-17.4					11
17.5-17.6			7	3	2
17.7-17.8			1	2	2
17.9-18.0				3	7
18.1-18.2					3
18.3-18.4			1	1	4
18.5-18.6					1
18.7-18.8					
18.9-19.0				1	
19.1-19.2				2	3
19.3-19.4					
19.5-19.6				1	
19.7-19.8					
19.9-20.0					
20.1-20.2					2

TABLE E

	Mean	Smoothed mean	<i>SD</i> from smoothed mean
Array under 15.1-15.2	16.55	16.20	.820 yr.
Array under 15.3-15.6	16.20	16.50	.535 yr.
Array under 15.7-16.0	16.90	16.80	.804 yr.
Array under 16.1-16.4	16.96	17.00	1.028 yr.
Array under 16.5-16.8	17.26	17.20	.955 yr.

If the means of corresponding arrays of brothers in the general population are the same as these we have the following as the five estimates of the correlation by the regression lines from 20.5 years through these means: .75, .86, .78, .84, and .85. Weighting each array equally, we have an average of .816. Weighting each by \sqrt{n} , we have an average of .826.

If the variabilities of corresponding arrays of brothers in the general population are the same as those for the Columbia group and if the *SD* of the general population is 1.8 years, we have .890, .956, .896, .821, and .847. If all determinations are weighted equally, the average is .88; if, as is much more reasonable, each is weighted by the number of cases, the average is .854. Averaging the .826 from the regression and the .854 from the reduction of the variability, we have .84.

I have additional data by which to compare the resemblance of siblings in intelligence-test score and in age at entrance to a certain grade in high school. All the pupils attending Grades IX, X, and XI, in May, 1922, in a certain city were tested with the *I.E.R. Test of Selective and Relational Thinking, Generalization, and Organization*. So also were all the pupils attending Grades X and XI in May, 1924. Among them were 812 pairs of siblings, all of whom were tested with another form of the test a year later. For 809 of these pairs, I have the age in months at the time of taking the test in May. Subtracting eight months gives the age at entrance for all save the few who were held back in that grade for a year or more.

There is a substantial variation in the age of pupils in the same grade, the standard deviation being 10.5 months. The correlation between siblings, using deviations from the mean of the group, is .20, whereas the correlation for intelligence-test score is .43 raw, and .45 after correction for attenuation. The resemblance in age at entrance with the influence of resemblance in test-score eliminated is only .01.⁸

⁸In the case of the Columbia brothers the corresponding correlations, using deviations from the means of the group, were .56 for age at entrance and .41 for

The same failure of age in a given grade to show as close resemblance among the young people of the city as intelligence-test score shows appears if we make any reasonable computations of the resemblance in the general population of age 14 to 18. If all the boys and girls of that city at that time had been kept in school until they had reached Grade 12 or had shown that further time in school would not advance them further, I estimate that half of them would have been in Grade 9 in May (the time of the test) by age 15 yr. 4 mo., in Grade 10 in May (the time of the test) by age 16 yr. 9 mo., and in Grade 11 in May (the time of the test) by age 18 yr. 0 mo. Seven-eighths of the siblings were younger.

The resemblance between siblings computed from deviations from these ages is .61. If all the boys and girls of that city at that time had been tested with the intelligence test, I estimate that the average scores for each age would have been as shown in the lines in Table 4 that are marked *B*. Five-sixths of the high-school siblings had higher scores. The correlation between siblings computed from deviations from these scores was .73 raw, and .78 after correction for attenuation.

I have also computed the resemblance for 486 pairs of high-school pupils in another city who were given the same tests, and showed a resemblance of .40 (.435 after correction for attenuation) in test score when deviations from the mean of the group were used. The variation in the age of pupils in the same grade is even larger than in the other city, the standard deviation being 11.1 months. The sibling resemblance in the age-grade relation was .23. The partial correlation after the influence of resemblance in test-score is eliminated is .05. The resemblance in test score if deviations from the means for the general population in the city are used is .66 raw, and .70 after correction for attenuation. I have not computed the corresponding correlation for the age-grade relation but it is surely lower than .70.

The comparison of resemblance in progress in school with resemblance in intelligence-test score furnishes a puzzle, as did that of resemblance in weight with resemblance in height. If the influence of family environment makes the resemblance among the Columbia brothers so much greater in age at entrance to college than in test score (.56 vs. .45 within the group, and .84 vs. .73 in the general population), how can it be so impotent in the case of age in Grades 9, 10, and 11 (.20 and .23 vs. .45 and .435 within the

intelligence-test score raw, and .45 after correction for attenuation. The resemblance within the group in age at entrance with the influence of resemblance in test score eliminated was .47 or .45

TABLE 4

AVERAGE SCORE IN THE SUM OF TWO TRIALS WITH THE INTELLIGENCE TEST, THE FIRST AT THE AGE SPECIFIED IN THE TABLE AND THE SECOND A YEAR LATER (*A*) FOR SUCH PERSONS AS STAY AT LEAST TWO YEARS IN THE HIGH SCHOOLS OF CITY II, AND (*B*) FOR THE GENERAL POPULATION OF CITY II

		12 yr.	13 yr.	14 yr.	15 yr.	16 yr.	17 yr.	18 yr.	19 yr.
0 mo.	<i>A</i>		348	375	400	424	446	466	486
	<i>B</i>		270	291	309	327	344	359	371
1 mo.	<i>A</i>		350	377	402	426	448	468	488
	<i>B</i>		272	292	310	328	345	360	372
2 mo.	<i>A</i>		352	379	404	428	450	470	490
	<i>B</i>		273	294	312	330	346	361	373
3 mo.	<i>A</i>		355	382	406	430	452	472	492
	<i>B</i>		275	296	314	331	347	362	374
4 mo.	<i>A</i>		358	384	408	432	454	473	494
	<i>B</i>		276	298	315	332	348	363	375
5 mo.	<i>A</i>		360	386	410	434	455	475	495
	<i>B</i>		278	300	317	334	349	364	376
6 mo.	<i>A</i>	332	362	388	412	436	457	476	496
	<i>B</i>	258	280	301	319	335	350	365	377
7 mo.	<i>A</i>	335	364	390	414	438	458	478	498
	<i>B</i>	260	282	302	321	337	352	366	378
8 mo.	<i>A</i>	338	366	392	416	440	460	480	
	<i>B</i>	262	284	304	323	338	354	367	
9 mo.	<i>A</i>	340	368	394	418	442	462	482	
	<i>B</i>	264	286	305	324	339	355	368	
10 mo.	<i>A</i>	342	370	396	420	444	464	484	
	<i>B</i>	266	288	307	325	341	356	369	
11 mo.	<i>A</i>	345	372	398	422	445	465	485	
	<i>B</i>	268	290	308	326	343	358	370	

group, and about .60 vs. about .70 in the general population)? Since the impotence is demonstrated with high reliability in two large cities, a better form for the question is "Why was the influence of family environments on school progress so great in the Columbia families, though it was near zero for nearly 1,300 pairs of siblings in Grades 9, 10, and 11?" The general influence of family environments by way of encouragement of normal and double promotions and discouragement of work and recreation that might prevent promotion is certainly very small.

One plausible reason for the difference in the case of the Columbia families is that economic conditions that keep a boy out of school for a half year or more to work play a much larger part. Another, less dependable, is that the Columbia families include a much larger percentage of parents with high ideals and low incomes who help their children greatly to get on in school, and on the other hand a much larger percentage of well-to-do parents who care little about when their children get into college, but make sure, by keeping them on in school, by providing tutors, and the like, that they get in sometime.

On the whole the facts reported here are very damaging to all doctrines that attribute great influence to home environment. Our siblings actually showed less resemblance in weight than in height and (except for the Columbia pairs of brothers) in rate of progress in school than in intelligence test score. This holds just as true if we omit all our estimated correlations for siblings in the general population and restrict consideration to the first-hand facts of the school populations with deviation measures taken from their own means. These correlations and their unreliabilities are given in Table F.

TABLE F

<i>Columbia brothers</i>	
Height, raw .50 ($PE = .025$)	
Weight, raw .37 ($PE = .029$)	
Intelligence Score, raw .41 ($PE = .028$), corrected for attenuation .45	
Age at entrance to college, raw .56 ($PE = .023$)	
<i>City I</i>	
Intelligence score, raw .43 ($PE = .019$), .45 after correction	
Age in grade, raw .20 ($PE = .023$)	
<i>City II</i>	
Intelligence score, raw .40 ($PE = .026$), .435 after correction	
Age in grade, raw .23 ($PE = .029$)	
<i>Teachers College</i>	
<i>Columbia University</i>	
<i>New York City</i>	

THE RESEMBLANCE OF SIBLINGS IN INTELLIGENCE-TEST SCORES*

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Most of the investigations of sibling resemblance in intelligence have reported correlation coefficients below .50. But there is now good reason to think that the true resemblance in, say, the native-born white population of the United States is .70 or higher, and that the lowness of many of the coefficients reported in the past was caused by measuring individuals from the mean of some restricted group instead of from the mean of the total population, and by the failure to correct for the inaccuracy of the instrument used to measure intelligence.

I have recently computed the resemblance in 409 pairs of brothers among students in Columbia College. The correlation, using deviations from the mean of the 409 in the test used is .41, but the estimated correlation for brothers in general measured from the mean of the general population is .73.

Fifteen years ago I studied the resemblance of 486 pairs of siblings in a certain city, all being boys or girls who had entered high school and stayed at least two years. The correlation, using deviations from the mean of the group itself, was .435 after correction for attenuation, but the correlation, using deviations from the mean for the general population of that city, was .70. This .70 is, however, subject to the possible selection of an undue proportion of children alike in intelligence because the siblings were found among pupils attending the high school in Grades 9, 10, and 11 in 1922 in Grades 10, 11, and 12 (plus a few pupils held back in Grade 9) in 1923, and also pupils found in Grade 9, September, 1924, and in Grade 10 in June, 1925. In a report made in 1928, I set .60 as the true correlation for the general population. I now think that I then underestimated the influence of the periods of selection in giving too many bright younger sibs and dull older sibs, and overestimated the influence of continuance to high school in giving too many pairs of sibs alike in being brighter than the other children in the family.

At that time I reported without analysis or comment the correlation of

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.73 for 812 pairs of siblings in high school in another city, deviations being taken from the mean of the general population assuming that to be the same as in the other city. I have re-examined the data from this city and have obtained the following results: The correlation of the 812 pairs, if deviations are taken from the mean of the group itself, is .43 raw and .45 after correction for attenuation. The correlation, using deviations from estimated averages for ages 13 to 18 in the whole population of the city, is, after correction for attenuation, .77.¹ This may be checked by using $\sqrt{1 - r^2}$ = variability of an array/variability of the total population, and assuming that the sib of any child scoring very high in intelligence will, except very rarely, be bright enough to be admitted to high school, so that the variability of the sibs of high arrays of our high-school group will be practically as large as the variability of the sibs of all persons in the general population who scored as high. The standard deviation of an array for the arrays forming the top 13 per cent of the group is 38.8 points of the test score. The standard deviation of the general population may be set as 53.5 for the average of an infinite number of tests such as the two used. Some boys and girls in their teens score 350 and an imbecile would score zero. By this method $r = .69$.

Outhit ('33), measuring father, mother, and children in 51 families, 30 of which had four living children each, and 21 of which had from five to 10 living children, found r for IQ of siblings to be .67, uncorrected for attenuation.² Since the tests used were Stanford-Binet for those under age 12 and Army Alpha for those older, with only a single trial in both cases, correction for attenuation probably would raise this to .80 or higher. The distribution of the children (mean IQ 107.65, SD of IQ 17.2) is enough like that of the general population to make any correction on that account unimportant.

Outhit gives the IQ of each of the 256 siblings so that we can compute the variability within each family from the mean of the sibs of that family. I have done so and the sum of the X^2 is 22899, giving an average intra-family SD of 9.5. This is however lower than the SD that would be found if the deviations could be taken from the true mean for all conceivable offspring of each pair of parents. That SD can be computed indirectly by taking each child's differences from all his sibs, finding the average, dividing

¹These averages are one standard deviation of the high-school group below the averages of the high-school group.

²Outhit was even more cautious than I was in 1928 and minimizes the discrepancy between his results and those of earlier workers.

by $\sqrt{2}$, and dividing further by .7989. Doing this gives 10.45. The *SD* of the *IQ* from one test with Stanford-Binet or Army Alpha is 17.2 for Outhit's entire population, and that for the entire native white youth of the country is not much different. If it is 17.2, $r = .80$; if it is 18, $r = .81\frac{1}{2}$; if it is 16, $r = .76$.

Raymond Cattell ('38), using the scores of 199 pairs of siblings from a bimodal group with many high-scoring and many low-scoring and few mediocre, but correcting the coefficient for this, computed the resemblance in the general population as .77. He was the first to assert emphatically that estimates of .50 or less for fraternal resemblance in intelligence are far below the truth.

No attempt was made by any of these investigators to measure the relative contributions of heredity and environment in producing the resemblance of siblings, and I will make none here. But it may be noted that the problem takes on a changed aspect if the resemblance is over .70 instead of under .50.

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DEVELOPMENT OF VISUO-MOTOR PERFORMANCE ON
THE MARBLE-BOARD TEST IN MENTALLY
RETARDED CHILDREN*†

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The present study, carried out with mentally retarded children of different mental ages, deals with the genetic aspect of visuo-motor performance as measured by the marble-board test (7, 8).

This marble-board test is a device which permits a quantitative and qualitative analysis of performance. The test material consists of two identical boards 11 inches square, a set of black and one of red marbles. Each board contains 10 rows of 10 holes each in which the marbles can be placed. The examiner places the boards side by side and, after having constructed the mosaic pattern out of the child's sight, requests the child to copy it on the second board. Six patterns are used (Figure 1). No time limits are set. The examiner, using a blank on which a scheme of the board has been drawn, records each move in sequence. This record not only indicates the errors; it serves likewise as a substitute for a moving picture recording, making it possible to analyze the visuo-motor process itself.

Previous studies (7, 8) have shown that such analysis is valuable in distinguishing between organized and unorganized procedure. The significance of such recording was brought out by the fact that a seemingly perfect result may be obtained without well organized procedure, or even without the ability to perceive the pattern as a clear-cut configuration. We could demonstrate by this method that mentally retarded children whose retardation is due to brain-injury perform incoherently whereas the true feebleminded (endogenous) children proceed in a well-rounded, continuous manner.

The subjects of the present study were 100 children from the Wayne County Training School. The mental retardation of these children is of

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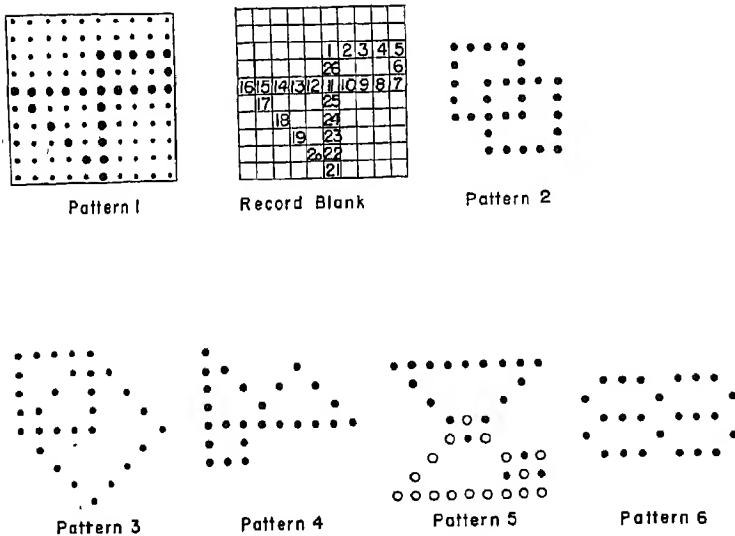


FIGURE 1
THE SIX PATTERNS OF THE MARBLE-BOARD TEST

the so-called endogenous or familial type; children whose mental impairment is due to brain-injury were excluded. The mean *IQ* taken from the revised Stanford-Binet was 67.5, the median 67, and the interquartile range 60.2 to 70.2. The entire group was divided into four sub-groups according to mental age. Each of the four groups (7.0-8.0; 8.1-9.0; 9.1-10.0; 10.1-11.0 years of mental age) consisted of 25 subjects.

The analysis of the performance on the marble-board was undertaken in three directions. One aspect was quantitative, the other two qualitative. The first part deals with correctness of achievement; the second, with types of performance in regard to sequence of moves; the third with the configurational organization.

MENTAL AGE AND CORRECTNESS OF PERFORMANCE

Table 1 shows the mean numbers of patterns correctly produced by the members of each mental age group. The results demonstrate a steady increase of correct performance with increasing mental age. Whereas, on the average, only one pattern was correctly constructed by the children with a mental age of 7-8 years, a member of the highest *MA* group made

TABLE 1
MEAN NUMBER OF CORRECTLY PERFORMED PATTERNS PER MENTAL AGE

<i>MA</i>	Mean	Sigma	<i>t</i>	<i>p</i>
7/8	1.3	1.9	4.0	<.01
8/9	3.5	1.5	2.1	<.05
9/10	4.4	1.4	2.8	<.01
10/11	5.5	.9		

nearly all patterns without errors. The improvement from each mental age to the next is statistically significant according to Fisher's *t*-test.

In order to inquire into the relative difficulty of the various patterns the percentage of children performing correctly each mosaic form was calculated. The results are represented in Table 2. In general, each pattern was

TABLE 2
PERCENTAGE OF CORRECT PERFORMANCES FOR EACH PATTERN AND MENTAL AGE

<i>MA</i>	Pattern I	II	III	IV	V	VI	Mean
7/8	20%	24%	16%	24%	24%	24%	22%
8/9	68	68	52	48	48	60	57.2
9/10	84	80	68	68	52	92	74
10/11	100	80	100	96	88	88	92

performed correctly by an increasingly greater number of children with increase of mental age. The last column of Table 2 represents the means of these percentages for each mental age. The differences between the means are again statistically significant.

MENTAL AGE AND TYPES WITH REGARD TO SEQUENCE OF MOVES

In previous studies Werner and Strauss have demonstrated that children differ in their procedure with respect to the sequence in the placement of the marbles. Such differences, as the record blanks reveal, are not necessarily related to the correctness of the performance.

One outstanding type of performance may be called the "continuity-type." Here the marbles are placed in continuous sequences following the same direction. Examples of this type are presented in Figure 2, *A*.

Another kind of performance may be named the "construction-type." This term refers to the manner in which the child handles the sub-forms constituting the six patterns (square, triangle of Pattern I; each of the two squares of Pattern II and of Pattern III; double-triangle and square

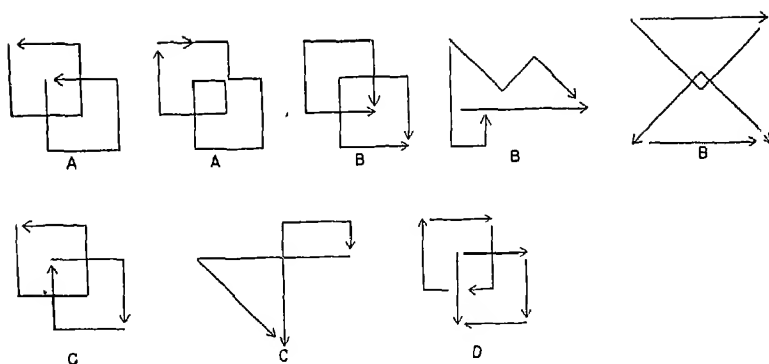


FIGURE 2

SEQUENCE OF MOVES (ARROWS INDICATE DIRECTION OF MOVES)

of Pattern IV; triangles of Pattern V; hexagons of Pattern VI). The building of a square is called "constructive" if it is enclosed from two sides in the manner represented in Figure 2, B. Figure 2, B illustrates this type of performance also on a triangle, and a double triangle. A performance type is called "partly constructive" if one elementary form of a pattern is built in continuous sequence whereas another is performed constructively. Examples of the partly constructive type are given in Figure 2, C.

Finally, a procedure may be called "irregular" if the moves are neither continuous nor constructive. The irregular type is illustrated in Figure 2, D.

In Table 3 the mean number of patterns performed according to one

TABLE 3
TYPES OF CONTINUITY (IN TERMS OF MEAN NUMBER OF FIGURES)

MA	Continuity		Partly Constructive		Constructive		Irregular	
		<i>p</i>		<i>p</i>		<i>p</i>		<i>p</i>
7/ 8	4.74	—	.08	<.02	.33	—	.85	—
8/ 9	4.74	<.01	.37	<.04	.37	—	.52	—
9/10	3.82	<.04	1.11	<.03	.52	>.03	.55	—
10/11	3.23		1.60		1.04		.13	—

of the four types have been calculated for each of the four mental age groups. The table indicates that throughout all mental ages the continuity type predominates. On the other hand, the number of irregular procedures is small. These results confirm those of an earlier study. There it was found that a group of children of the endogenous type of mental deficiency performed pre-

dominately in a "global" manner; irregular procedures (incoherent placements), though frequent with the exogenous (brain-injured) group, occurred rarely. Between mental ages 8 to 11, the continuity type declines significantly with increase in mental age. Conversely, there is a significant increase in constructiveness with growth in mental age, though the fully constructive performance rises significantly only between the 9/10 and 10/11 mental age level. Increase in the constructive type of performance suggests a growing ability in visual form analysis to be discussed in the following section.

MENTAL AGE AND PERFORMANCE IN REGARD TO CONFIGURATIONAL ORGANIZATION

The method of recording the moves on the board makes it possible to analyze the child's procedure under a third aspect. Here we are concerned with the development of form as a guiding principle in visuo-motor performance irrespective of correctness or sequence of moves. With regard to the configurational aspect several kinds of performance can be distinguished:

1. Since two or more elementary forms are interrelated in each of the six patterns, the most "articulate" performance consists in the construction of the complex patterns out of its sub-forms. The child copies, for instance, Pattern II by building first one square, then the other. Such performance presupposes obviously that the child recognizes the two sub-forms with respect to each other and to the whole (see Figure 3, *A*).

2. In other types of performance a strict interrelationship of the parts with respect to the whole is lacking, i.e., either the whole or the parts dominate as visuo-motor guides.

- (a). The procedure may be guided by the form quality as a whole; here, the child follows primarily the outline separating the figure against the background. Instead of building the interlocked squares of Pattern II he may make the contour first, placing into this frame the remaining small square (see Figure 3, *B*).

- (b). Seemingly opposed to the "global" type is a procedure steered by parts rather than wholes. Conspicuous smaller units are placed side by side; the end product instead of being a closely knit structure appears then as an aggregate of elementary forms. An accomplishment by aggregation may objectively still be correct as Figure 3, *C* shows; but it may also lead to certain errors as, for instance, actual separation of sub-forms.

Though in logical contrast to each other, performances in terms of the whole-form and of aggregate parts are genetically related. Genetic psy-

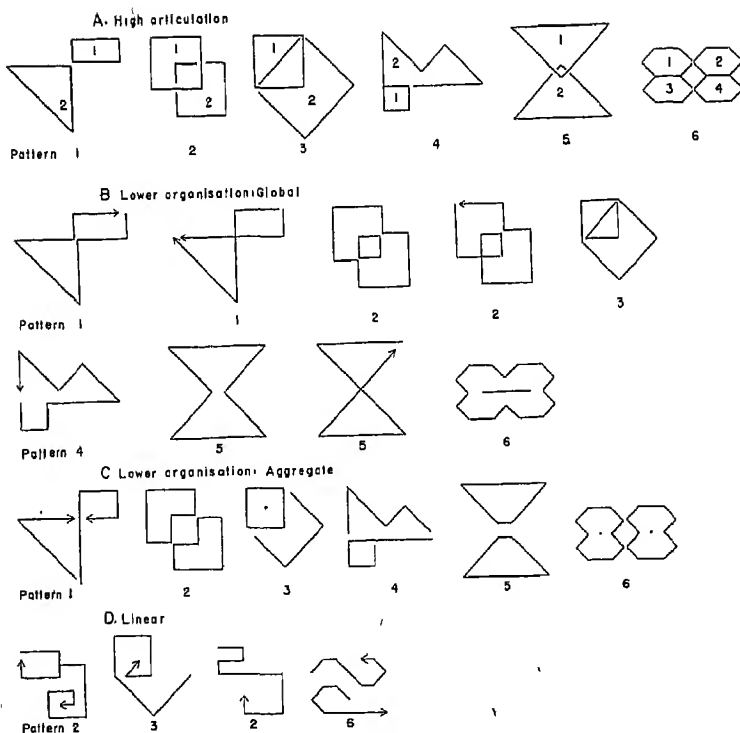


FIGURE 3

CONFIGURATIONAL ORGANIZATION (EACH FIGURE INDICATES THE STRUCTURE OF THE PATTERN AS REVEALED BY THE CHILD'S PERFORMANCE)

chology (5) has shown that both globality and aggregation indicate an early stage of organization; both lack the analytic-synthetic relationship which appear at more mature levels of activity. For this reason the two kinds of lower visuo-motor organization have been combined in the statistical calculations.

3. Finally, in copying a pattern the child may follow *lines* rather than forms. In some cases one can still recognize that the child is at least partially guided by form, though, in the main, he executes in linear sequences. In other cases the "line trend" is the outstanding feature of the performance (see Figure 3, D).

The frequency of occurrence of the various performance types with regard to form at the different mental ages have been calculated for each of the six patterns. Table 4 presents the means of the frequencies of the six

TABLE 4
TYPES OF CONFIGURATIONAL ORGANIZATION

MA	Form		Global or		Partially		Line	
	Part-whole relation- ship	p	aggregate	p	line trend	p	Line trend entirely	p.
7/ 8	21.3%		28.0%		16.6%		34.6%	
8/ 9	33.0	<.03	28.0	—	23.3	—	16.6	<.01
9/10	44.0	<.05	33.3	—	10.0	<.02	13.3	—
10/11	66.6	<.01	26.0	—	3.3	<.03	4.0	<.01

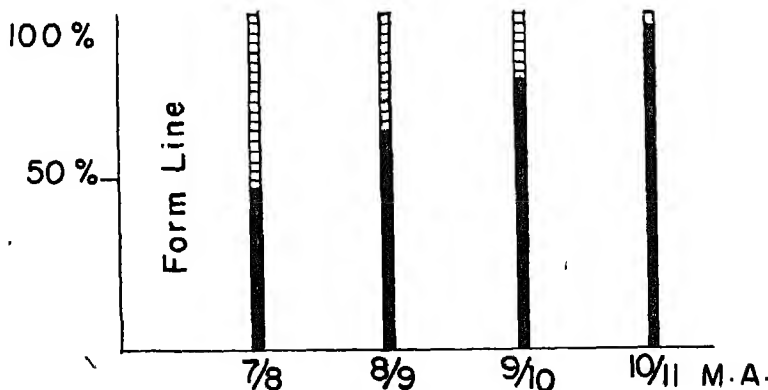


FIGURE 4
DEVELOPMENT OF FORM-GUIDED AGAINST LINEAR PERFORMANCE

patterns with respect to mental age. For constructing the graph, Figure 4, the figures of the first two main columns of Table 4 were combined; similarly the frequencies of the last two main columns were lumped together for each mental age. The graph presents a picture of the genetic relationship between performance guided entirely by form and performance showing the line trend. The table and graph indicate the following findings:

1. Throughout the mental ages a highly articulate performance, consisting of the construction of a complex pattern out of its constituent forms, increases steadily and significantly with mental growth.
2. A performance guided by a less articulate form (global and aggregate form-types) varies little within the mental age groups considered in this study.

3. A performance during which the child follows partially or entirely lines rather than forms, decreases significantly with mental growth.

4. The data presented in the graph suggest that at the eight- to nine-year mental age level forms begin to dominate over lines in guiding visuo-motor procedure.

DISCUSSION

1. *Correctness of Response*

It will be generally agreed that visuo-motor performance such as tested on the marble-board involves the interaction of kinaesthetic and visual factors. The increase in the correctness of visuo-motor response with increase of age indicates three genetic facts, viz., development of kinaesthetic-motor functions, of visual form perception, and of interrelationship between kinaesthesia and vision.

In evaluating an individual child's performance, one should be aware that the functional level is determined not merely by the quantitative test results, but also by the qualitative data, with regard to sequence of moves and to form. Moreover, further valuable information can be gained by letting the child draw a picture of each pattern. Such drawings are part of the complete test though they have not been considered in this study. One may sometimes find in individual cases a strange discrepancy between correctness of performance and efficiency of functioning. A child may, for instance, draw a pattern correctly indicating his ability to perceive and analyze visual forms; at the same time his visuo-motor execution on the marble-board may be poor. Another child may perform correctly on the marble-board whereas his drawings and his manner of procedure as recorded on the blank may reveal poor perceptual analysis: the seemingly good performance may be accomplished by compensating the visual deficiency by logical operations, i.e., by counting the holes for placing each marble, or by a keen kinaesthetic sense which enables him to follow the directions of the lines, etc. If, however, age groups rather than individuals are considered, such discrepancies become negligible and a close correspondence appears to exist between correctness of performance and visuo-motor integration.

2. *Sequence of Moves*

Developmental psychology has shown that sensory-motor activity is relatively early organized in terms of unbreakable wholes (5). A normal young child has, for instance, the tendency to retain and reproduce auditory-motor

material (rhymes, poems, melodies) as a continuous unit. The same is true for drawings, demonstrated in the trend of young children to reproduce a four-cornered figure like the square by a continuous circular line. It may be noted that rounding up the corners of the straight-lined forms is a typical feature of the performance of younger children on the marble-board. The frequency in the occurrence of our "continuity type" and its decline with growing age can be therefore interpreted as due to the tendency toward global organization appearing rather early in the normal child. The older the child the higher the organization of his activity. Growing differentiation in visuo-motor activity is signified by the emergence of the "constructive" type where continuity is partly abandoned in favor of a synthetic building procedure.

3. *The Form Factor*

One of the principal results of this study is the relatively high percentage of performances in terms of *lines* rather than *form* found in the younger age groups and the increase of form-guided procedures with growing mental age. These results may be interpreted by the assumption that guidance by lines indicates a dominance of tactual kinaesthetic factors over visual factors, and, that the increase of form-guided procedure indicates a developmental shift from tactual-kinaesthetic to visual dominance. Such hypothesis is in agreement with certain facts known from genetic psychology. During development of space-perception and space relations, for instance, a qualitative change occurs. The primordial space dominated originally by kinaesthetic-tactile factors (Piaget's "practical space") is shifting more and more in the direction of an "objective space" dominated by visual perception. A number of pertinent experimental facts deals with tactual localization. Renshaw and collaborators (2, 3, 4) performed experiments in which the subject was required, with and without the use of vision, to touch a stimulated point on the skin. The results of these experiments suggest a shift from a tactual-visual to a visual form of localization occurring with normal children around the chronological age of 13 years. A similar shift during the development of space relations has been advocated by Piaget (1). Such a shift in dominance has been observed by us in an experiment dealing with the perception of spatial relationship in mentally deficient children (6). The experiment (analogous to the Knox Cube test) consists of two series. In Series 1 (tap series) the experimenter tapped four squares in a given order. In Series 2 (flash series) the sequences were optically produced by

lighting the squares in succession. In both series the child was requested to touch the squares in the same order as presented. Whereas children of younger mental ages perform better on the tap series than on the flash series, older children show fewer errors on the flash series. This experiment suggests that in the perception of space relations a shift in dominance from kinaesthetic to visual factors takes place during development. The shift occurs at the 8- to 9-year mental age level.

It may be noted that in the present experiment the shift in dominance from line-guided to form-guided performance occurs also at the 8- to 9-year mental age level. This coincidence in the results of the two experiments is possibly not accidental since both deal with visuo-motor performance involving rather abstract (geometrical) relationships in space.

Within the epoch where form-guided performance is dominant a further development has been observed. It concerns the growing ability of articulation, i.e., of distinguishing and relating parts within the framework of the whole. Increasing articulation and differentiation is one of the fundamental facts established by genetic psychology (5).

In drawings and kindred sensori-motor activities of the young child one observes these two forms of less articulate organization: the forms produced are either global, i.e., lacking differentiation of parts in favor of the whole, or aggregative, i.e., lacking synthesis in favor of smaller global units with little relation to one another. These primitive forms of organization make up approximately one-third of the performance on the marble-board, varying little within the range of the mental ages considered in this study. It is most probable that the lower kinds of organization of form, the global and aggregative type, have a close relationship to the continuity type of sequence, whereas the highly articulated organization of form seems definitely related to the constructive type of sequence. The assumption of a correspondence between perception of form and type of sequence agrees well with the fact that at the 10- to 11-year mental age level at which the highest type of form organization rises above 50 per cent, comprising two thirds of all performances, the constructive type of sequence increases sharply.

SUMMARY

1. Quantitative and qualitative development of visuo-motor performance has been analyzed by means of the marble-board test. The test consists of six mosaic patterns to be copied by the child. The subjects were 100 mentally retarded children divided into four groups of mental age levels 7-8, 8-9, 9-10, 10-11.

2. Correct performances increase significantly with increasing mental age.
3. Throughout the mental ages the "Continuity-type" of performance predominates, but declines with mental growth. This type is characterized by the placement of the marbles in continuous sequences. With increasing mental age the continuity type is more and more frequently replaced by a "constructive" kind of performance consisting in the enclosing of a mosaic form from two sides.
4. With respect to the configurational aspect, highly articulate form organization increases significantly with mental age. Such a high type of organization consists in the building of a complex pattern out of its components; the performance gives evidence that the child has grasped the inter-relationship of parts within a whole. A performance showing a lower kind of organization (global and aggregative type) varies little within the mental age range considered in the study. A procedure guided by lines rather than form decreases significantly with mental age growth. The 8- to 9-year mental age level appears to be a significant turning point for this development; it signifies a shift of dominance of guiding factors from the kinaesthetic to the visual field.

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A STUDY OF SEX DIFFERENCES IN PRESCHOOL
CHILDREN'S ADJUSTMENT COEXISTENT
WITH INTERPARENTAL TENSIONS*

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The literature of today suggests that there is important connection between tensions in the interparental relationships and child adjustment. Studies in various areas point to the relation between marital disharmony of the parents and maladjustment in the child's personality and behavioral manifestations. Bretnall (3), Witmer (38), Macfarlane (21, 22), Hubbard and Adams (16), Wallace (36), Cohen and Davis (6), for instance, point to the status of the marriage relationship of the parents as bearing influence on the outcome of child guidance treatment. Lamkin (18), Towle (35), and others, attribute child maladjustment in large part to marital conflict in their analyses of child guidance clinic cases. Studies of adolescents and college students, as those of Thurrow (33), Bowers (2), Goodwin Watson (37), point to discomfort and conflict for the children as emanating from discordant parent relationships. The connection of the child's adjustment to maternal rejection and overprotection, which in turn relate in an appreciable degree to the marital status of the mother, has been indicated, for instance by Figge (9), Gleason (12), Lewenberg (19), Newell (28, 29). Influence on specific behavior problems or phases of child adjustment has been similarly indicated, for example, by Grant (13), Lurie (20), Mohr (25), and by Giblette and Macrae (10) as a psychogenic factor in anorexia; by Kawin (17) as a factor in poor social adjustment; by Totten (34), as bearing weight on such behavior as stealing, truancy, lying, and disciplinary difficulties; by Halloway (14) and Neumann (27) on withdrawal from playmates; by Sewall (30) on jealousy; and by Childers (5) and Ginsburg (11) on hyperactivity. Tensions in the relationship of marriage partners have been variously investigated, as in studies by Davis (7), Burgess and Cottrell (4), Terman (31), Woodhouse (39), Hamilton (15), Terry (32), Dickinson (8), and Mowrer (26). Lurie (20) and Macfarlane (23) indicate that there is some difference between boys and girls in so-called problem behavior.

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On the whole, investigations of the two areas, that of marital relationships and that of child adjustment, have been kept separate. Baruch (1), however, attempted to draw the two areas together. She investigated certain types of tension in the marital interrelationships of parents as coexistent with child adjustment. Her study asked whether certain types of tension were more significantly related to child adjustment than were others in the group under investigation.

The present study attempts to extend Baruch's study of 33 cases. It summarizes and analyzes data gathered by her in 43 new cases, in addition to the 33 used in her study. It attempts to find to what extent child adjustment coexists with parental tensions in a larger sample consisting of 76 cases. It attempts further to determine whether satisfactory adjustment coincides in boys to a higher degree than in girls, and vice versa, in instances where the five tensions found most significant were reported to be present.

The study focuses on families with preschool children, since for the child of this age, influences outside the family have not yet as strongly impinged themselves on personality and adjustment. They have not yet, as it were, diluted the influences from within. The study, moreover, deals with children living normally at home with both parents, not with institutional or clinical cases, nor with children from broken homes.

Since the senior investigator had the advantage of direct contact with both parents and children, it was possible to gain a more integrated picture than would have been feasible had she needed to rely on indirect sources of information, as from clinic or school files.

SUBJECTS

Seventy-six children and their parents were included in the study. The children were enrolled in the preschool laboratories of the Broadoaks School of Education, Whittier College.

Cases were selected on the following bases: (a) presence of the child in the above mentioned school situation so that he could be observed at the same time that the parental relationships were under investigation; (b) willingness of one, or preferably both parents to cooperate in the study; (c) the absence of gross major defects in the home, such as extreme poverty, serious illness, and the like, to exclude the effect of these so that the weight of the more subtle factors might not be overshadowed; and (d) both parents living together at the time of the study, to exclude broken homes. No adopted children were included.

In 65 cases both the father and the mother coöperated in the study. In 117 cases the mother only.

The occupations of the fathers fell, with the exception of five cases, in the two highest occupational classes on the Sim's *Scale*. Ages of the fathers ranged from 28 to 54 years, with a mean age of 33.3; of mothers from 25 to 43 years with a mean of 31.3. Length of marriage ranged from 5 to 17 years with a mean of 8.3. The majority of both fathers and mothers were college graduates.

According to external appearances, the parents were apparently without serious marital maladjustment. To the ordinary observer they appeared as a very "normal" group. To the investigator, however, during the course of the study, many unsuspected points of tension were disclosed. Slightly more than half the group (parents of 41 children), however, were judged by both investigators separately (with disagreement on two cases only) as "happily" married.

The ages of the child subjects at the beginning of the cases ranged from 1 year, 6 months to 5 years, seven months, with a mean age of 3 years, 3 months; and at the close of the cases, from 2 years, 6 months to 6 years, 1 month with a mean age of 4 years, 6 months. They were enrolled in the preschool, under investigation, from 1/4 to 7 semesters, the mean number of semesters being 2.8.

The intelligence quotients according to the Kuhlmann Revision of the Binet-Simon scale (used with children under 3 years, 6 months)¹ or the Stanford Revision (used with children over 3 years, 6 months) ranged from 92 to 175, with a mean of 122, a median of 124, and standard deviation of 16 ± 1.35 .

PROCEDURE

Preliminary selection of parental items to be included was made on the bases of existing literature. The items were then evaluated for applicability to the present group in the light of an examination of 31 cases, previously dealt with, composed of personnel similar to that of the present study and in which there had been overt expression of marital dissatisfactions.

Procedure for securing data on interrelationships of the parents was that of free interviews of the psychiatric social work type, in which rapport in the relationship of investigator to parent was recognized as an important factor in freeing the parent sufficiently to give expression to intimate details

¹Prior to 1939 and then discarded in favor of the New Stanford Revision.

concerning his life. Fortunately, circumstances under which the data was secured, were such that rapport could emanate from first-hand continuous contacts between parents and investigator.

In the frequent observations by parents at the school, they saw the investigator as preschool director in close contact with their children, sharing a mutual interest in them. In group meetings and individual conferences, an atmosphere of freedom was fostered for the parents' expression not only of intellectualized but also of emotional content. All through, there was an effort to help the parent as a person to tolerate the realities of his own feelings, not to deny them, the attitude being held that the parents' emotions were very real influences in the child's environment, and further, that such emotions were not facts to sense guilt over, but rather, natural and "normal" as an outgrowth of the life experience of the parents as individuals. Thus, the discussion of marital tensions did not entail either a sudden freeing or an essentially new sort of relationship of parent and investigator, but merely an extension of expressiveness and of confidence already established.

Participation was secured through telling parents about the study and asking for their coöperation. Reassurance was, of course, given that data would be disguised and that no information would be divulged to respective husbands or wives.

During interview the items to be investigated were kept in mind, but no forms or outlines were in view, nor was interview material confined to the items. Rather, parents were given plenty of opportunity to talk along lines which they seemed inclined to pursue, the investigator bringing in an item where it seemed to fit, not in any set order or phraseology but in whatever way appeared most natural and least pointed. Direct questions were minimized following Marcus' caution that "Direct questions may make it psychologically impossible for him (the client, or here, the parent) to express himself as he really is. . . ." (24, p. 358).

In regard to items that could have caused embarrassment or a desire to cover up, care was taken to stress the widespread incidence of similar occurrences. Thus, some remark was usually made as to the commonness of various tension as the discussion of these arose in relation to the interviews. Similarly other techniques were utilized to keep the subject at ease through the interviews.

Notes during interviews were transcribed directly after, and the transcriptions were analyzed prior to the next interview, for items included. The presence or absence of each item was then checked on a blank containing a full list of the items to be investigated. In this way those items still needing

investigation could be readily discerned. The number of interviews averaged 13 per family.

The children were observed in the preschool situation. Their adjustment was rated on a scale developed for use in Baruch's (1) study, and based on a concept of "adjustment" as including primarily three major types of functioning, namely, the child's adjustment to himself and his reciprocal interaction within his family and social (school) groups.

Each child was rated separately on this scale by one of the investigators and by the head teacher of the group in which the child was enrolled, at the beginning and at the close of his case. From these four discrete ratings, an average adjustment score was obtained on the basis of which an average adjustment of "satisfactory" or "poor" adjustment was assigned to each individual.

Records of the problems of the children were kept in the preschool situation. Reports were obtained from home on problematic behavior to supplement school records. Problems were then entered onto a check list arranged, with a few adaptations, according to headings used by Ethel Kawin in *Children of Preschool Age* (17, pp. 231-238; 265-267).² Problems were also rated according to an adaptation of the *Coded Scales of Behavior* developed by Dr. Jean Macfarlane at the University of California Institute of Child Welfare (23).

It should be said that the withdrawing problem was recognized as specifically as was the more aggressive sort, and that all through the preschool there was an emphasis on helping the child to express himself emotionally. This last is mentioned since, for the study under consideration, it may have meant that problems which might have been repressed in more prohibitory situations were quite freely evidenced here.

The coexistence of the presence or absence of each item of tension in the interparental relationship to child adjustment was estimated as follows: (a) By the average of the percentages of poor adjustment in cases where tension was present, and satisfactory child adjustment in cases where tension was absent, the resulting percentage being called, for purposes of the study, a *ratio of coexistence*. (b) By the *critical ratio* of differences in proportion of child adjustment coexistent with the presence of parental tension and with absence of parental tension; and following the customary procedure of considering the difference a statistically significant one if it equalled three times or more its standard error.

²Permission to use this material was given by author and publishers.

FINDINGS

1. *Coexistence of Items in the Marital Relationships of the Parents With Child Adjustment*

There were certain items in the interparental relationships which showed a coexistence ratio of over 70 per cent with child adjustment and likewise a critical ratio indicating a significant difference in the adjustment of the child where the item was present and absent (see Table 1).

a. *Tension Over Sex.* *Tension over a lack of sexual satisfaction* ranked highest among the various items. It existed in 50 out of the 76 cases. In these 50 cases, six children, or 12 per cent, were satisfactorily adjusted and 44, or 88 per cent poorly adjusted; whereas in the 26 cases where sexual satisfaction was present, 23, or 89 per cent, of the children showed satisfactory adjustment and only three showed poor adjustment.

Thus the coexistence ratio of this tension with child adjustment was 89 per cent. The critical ratio 9.93.

As illustrative of the sort of qualitative data given in interview, the following excerpts are cited:

Case 64: The father reported that the wife "is just tense." . . . "She wants to but she just can't." He has tried to get her to respond and once in a while she does have orgasm, but most of the time it is no good. Then she cries and cries and wonders why she can't. It has gotten him down and she is so irritable from it she is fussing all day long.

Case 46: Mother reported that she didn't like intercourse very much. . . . She guesses she is just frigid. . . . She doesn't allow herself to be aroused any more. She used to start in getting very excited when she was first married and then she would be disappointed and not have any satisfaction, and it would leave her with a stomach ache, and she would feel all discouraged and disgusted, and so she decided she wouldn't get excited any more at all.

Case 34: Father's report: "I have tried everything I know. I have talked to her. I have tried making love to her. I have tried making love to her in every way possible, but it is just as if there were a wall between us when it comes to sex. She complies, but she does it more as a duty. . . . I think she thinks she must do her duty well or she will lose out on the possessive business with me." He said that the whole business got him down so terribly that a few years ago he had ulcers. . . .

Case 57: Mother feels sex is all right at times. She moves in a cycle. The first two weeks of the month are fine and the last two weeks she is slowed down, and does not want sexual relations. She has low thyroid. The father is hurt and resentful when she does not respond and it makes him feel badly. She has orgasm only at times.

TABLE 1
COEXISTENCE RATIOS AND CRITICAL RATIOS OF DIFFERENCES IN PROPORTIONS OF CHILD ADJUSTMENT COEXISTENT WITH INTERPARENTAL TENSIONS

Inter-parental tensions	Parental tensions existed					Parental tensions absent					Diff. of propn.		Critical ratio	Coexistence ratio
	Total Satisfactory child adj.					Total Satisfactory child adj.					Amt. of diff. $P'-P$	Sigma $P'-P'$		
	Cases N	N'	P	Propn. P	Sigma P	Cases N	N'	P'	Propn. P'	Sigma P'				
Sexual relations	50	6	.120	.045		26	23	.885	.062		.765	.077	9.93	.89
Consideration	38	3	.079	.044		38	25	.658	.077		.579	.088	6.56	.79
Inability to talk through	51	12	.235	.059		25	18	.720	.090		.485	.107	4.53	.74
Affection	37	6	.162	.062		39	22	.564	.079		.402	.100	4.02	.70
Ascendancy-submission	35	7	.200	.067		41	21	.512	.077		.312	.102	3.06	.66
Cooperation over child	40	9	.225	.066		36	19	.528	.083		.303	.105	2.88	.65
Friends	34	7	.206	.069		42	21	.500	.077		.294	.103	2.85	.65
Leisure	38	7	.184	.063		38	18	.474	.081		.290	.102	2.84	.64
Work	41	11	.268	.069		35	18	.514	.084		.246	.109	2.26	.62
Relatives	34	11	.324	.080		42	22	.524	.077		.200	.111	1.80	.60
Health	16	4	.250	.011		60	25	.417	.064		.167	.065	2.57	.58
Finances	33	9	.273	.077		43	18	.419	.075		.146	.107	1.36	.57
Tastes	18	5	.278	.110		58	23	.397	.064		.119	.127	.93	.56
Extra marital relation	9	4	.444	.165		67	26	.388	.059		.056	.175	.32	.47
Criticalness	53	19	.358	.066		23	9	.391	.101		.033	.121	.27	.52

Or the opposite type' of report:

Case 19: The mother said that, in their case, sex relations were satisfying to both of them. They both had read a lot and felt that it was important to work it out. Her mother had been a very tense person . . . nervous . . . the mother felt, because she had never adjusted sexually. Both of them, however, are satisfying each other. She has orgasm every time . . . afterward feels very relaxed and easy.

Chief complaints on the part of the men were that the women were not sufficiently responsive and were not willing to have intercourse frequently enough; on the part of the women, that the men did not make sufficient love, that either they felt the men "too fast" or themselves "too slow," and that the men did not seem to care about the partner's satisfaction.

b. Tension Over Consideration. Tension over a feeling that enough consideration, sympathy, and the like, was lacking in one parent for the other, existed in 38 of the 76 cases. In these, three children, 7 per cent, were satisfactorily adjusted, and 35, or 93 per cent, poorly adjusted. In the 38 cases where the parents were satisfied with the consideration, sympathy and attentiveness emanating from one to the other, there were 25 children, 66 per cent, satisfactorily adjusted and 13, or 34 per cent, poorly adjusted. Thus, the coexistent ratio with child adjustment was 79 per cent, and the critical ratio 6.56.

Expressions of conflict are typified by the following:

Case 42: Mother reported that father is the most inconsiderate and unsympathetic man she knows. He never thinks of her . . . She cried . . . Said that birthdays and wedding anniversaries can go by and he never notices.

Case 38: Father reported that mother makes a fuss over him and he resents it. Last week, he came home from up north and she was late to meet him at the station. Then, when she saw him there was no fuss or being glad to see him. That has happened many times before. She doesn't seem to care about seeing him. He isn't even worth coming to the station on time for. She isn't like other wives about giving him a little extra attention by having things on the table that he especially likes, etc.

Whereas a relationship of an opposite sort was described, for example, in:

Case 2 and 22: The mother reported the father to be a very sympathetic and sensitive person. She would never have a baby without him right there. He was very thoughtful of her, and she hopes she is of him.

Case 3: The mother reported that if either of them has trouble, they naturally give each other sympathy. Each wants to help the other person . . . the father remembers even to comment on the monthly occurrence

of the date of birthdays, etc., and always to comment to her how happy he is that . . . they got engaged or whatever it was.

The other three items which, along with the foregoing, presented the five significant critical ratios in relation to child adjustment were *tension over lack of expressed affection*, *lack of ability to talk through differences to mutually acceptable solutions*, and *tension over the ascendance-submission relationship*.

c. *Tension Over Affection*. *Tension over lack of expressed affection* was present in 37 of the 76 cases. In these cases six children were satisfactorily adjusted, and the remaining 31, or 84 per cent, were poorly adjusted. In the 39 cases where sufficient expression of affection was felt, 22 children, or 56 per cent, were satisfactorily adjusted, and 17, or 44 per cent, poorly adjusted. The coexistent ratio with child adjustment was 70 per cent, and the critical ratio 4.02.

Where there was tension on this score, reports were, for example, as follows:

Case 55: Mother reported that the father isn't affectionate enough to her. He doesn't ever tell her nice things about herself. She thinks he is crazy about her, but she can't be that way about him. She feels "edgy" about it all, and she has to "jack" herself up by taking highballs every evening before she gets the children to bed.

Case 6: The father reported that the mother says the only time he gives affection is when he wants sexual relations.

In other cases, expression of affection did emanate from one to the other and appeared to bring a sense of satisfaction with it. For example:

Case 3: The mother said they were both very demonstrative. She thinks a man requires it. He should have a feeling that he is grand and that she thinks so. And he does the same with her.

d. *Inability to Talk Things Over*. *Tension over lack of ability to talk over differences to mutually acceptable solutions* was reported in 51 cases. Of these cases, 12 children, or 24 per cent were satisfactorily adjusted, and in 39, or 76 per cent of the cases, it was poor. Of the 25 cases where the parents were able to talk through differences, 18 children, or 72 per cent, were satisfactorily adjusted, and 7, or 28 per cent, were poorly adjusted. Hence, the coexistence ratio was 74 per cent, and the critical ratio was 4.53.

Following are examples of reports on inability to talk things over:

Case 67: Father reported that whenever mother takes a notion she wants something she throws a temper. He can't do anything but give in

or get mad. They can't talk over things decently, and then after they lose their tempers at each other they don't talk for days—literally.

Mother reported that she has tried to talk with the father but can't talk anything through with him. He can't talk. He can't let loose and talk. He shuts in and gets moody and she does the same thing.

Case 38: Father's report, "It is just one of those arguments and disagreements without end" that make him wonder whether he hadn't made a mistake to marry the mother.

In cases where the couples could talk things through, reports ran, for example, as follows:

Case 30: The mother stated that when something important came along they discussed it from every angle. They always talk things over and manage to come to decisions that are comfortable to them both. She thinks this is very important because the father was a very unhappy boy and it would not be good for him to stay unhappy and imposed on.

e. Tension Over Ascendance-Submission. Tension over Ascendance-Submission existed in 35 of the 76 cases. In these 35 cases 7 children, or 20 per cent, were satisfactorily adjusted, and 28 or 80 per cent poorly adjusted. In the 41 cases where tension on this score did not exist, 21, or 51 per cent, of the children were satisfactorily adjusted, and 20, or 49 per cent, poorly adjusted. The coexistence ratio of this tension to child adjustment was hence seen to be 66 per cent, less than 70 per cent as the other cases showed, but the critical ratio was 3.06, and therefore significant.

In many cases where there was tension over this relationship, the mother was considered ascendant, or was trying to be ascendant. For example:

Case 67: Mother reported, "My father treated my mother badly, and I am not going to let any man treat me that way. I am not going to be walked over." Then following the worker's comment that because the father might be afraid of being dominated, he might be struggling for achievement to the point of neglecting her simply to prove to himself that he was strong. The mother said she had never thought of that before and she has probably been doing just the wrong thing, because she has tried to get him to cater to her, which would make him feel dominated.

Sometimes, the mother herself resented the fact that she needed to take the ascendant role. As, for example:

Case 50 and 51: Mother commented that the father's efforts to fit in with what she wants increases the tension in the home. She would rather have him stronger and not trying to help her be so perfect.

Often the father's ascendance caused tension. As, for example:

Case 43: Mother reported that she resents the way the father thinks he can command her and she will obey. It gets her down.

In some cases the father's ascendancy appeared, according to reports, to be acceptable and right for both partners, as, for example:

Case 14: The mother reported the father boss of the family. She likes it that way. She feels he should be the head of the family. She is more of the clinging vine type and likes to look up to him.

In some cases, mutual decision making appeared to be the order. Following is an example:

Case 30: The father feels that their decision making is very much of a fifty-fifty proposition. He doesn't believe in the woman wearing the pants of the family or in the husband being dominating and bossy. They work things out together.

f. *Other items.* Other items which were investigated and were found not significantly related to child adjustment were. Lack of coöperation on the upbringing of the child; extramarital relations; tension over health; tension over friends; tension over work; tension over relatives; tension over leisure pursuits; tension over finances; tension over the criticalness of the partner; tension over differences in tastes (see Table 1).

2. *Coexistence of Items in the Marital Relationships of the Parents With Adjustment of Boys as Compared With the Adjustment of Girls*

The group was divided according to sex and the data on boys and on girls treated separately, in the same manner that data on the whole group were treated. This was done to determine whether satisfactory adjustment coincided in boys to a higher degree than in girls, or vice versa, in instances where the five most significant tensions were reported present.

There were 42 boys in the sample and 34 girls. The following analysis of data presents the findings in relation to the 42 boys:

1. Tension over lack of sexual satisfaction occurred in 30 of the 42 cases. In these 30 cases, five of the boys, or 17 per cent, showed satisfactory adjustment, and 25, or 83 per cent showed poor. In the 12 cases where no tension on this point occurred, 10 boys or 83 per cent, showed satisfactory adjustment and the remaining 2, or 17 per cent, poor. Thus, the co-existence ratio of this tension with the adjustment of boys was 83 per cent and the critical ratio was 5.42.

2. There was tension over lack of consideration in 20 of the 42 cases. In these 20 cases two boys, or 10 per cent, were satisfactorily adjusted, and

18, or 90 per cent, poorly adjusted. In the 22 cases where the tension was absent there were 12 boys, or 55 per cent, satisfactorily adjusted, and 10 boys, or 45 per cent, poorly adjusted. The coexistence ratio was 72 per cent and the critical ratio 3.56.

3. In 27 of the 42 cases the ability to talk over differences until mutually acceptable solution could be reached was absent. In six of these cases the boys were satisfactorily adjusted, 22 per cent, whereas 21, or 75 per cent of the boys were poorly adjusted. Of the 15 remaining cases 9 boys, or 60 per cent, were satisfactorily adjusted, and 6, or 40 per cent, poorly adjusted. The coexistence ratio here was 69 per cent, and the critical ratio 2.54.

4. Tension over lack of expressed affection existed in 19 out of the 42 cases, and of these 19 cases three, or 16 per cent, of the boys were satisfactorily adjusted, and 16, or 84 percent, of them were not. In the 23 cases where the tension was absent, 12 boys, or 52 per cent, were satisfactorily adjusted, and 11, or 48 per cent, were poorly adjusted. Thus the coexistence ratio was 68 per cent and the critical ratio 2.74.

5. In the 19 cases where tension over the ascendance-submission relationship occurred, one, or five per cent, of the boys were satisfactorily adjusted and 18, or 95 per cent, were not. In the 23 cases where the tension was absent, 14, or 61 per cent, were satisfactorily adjusted, and nine, or 39 per cent, were poorly adjusted. The coexistence ratio showed to be 78 per cent and the critical ratio 4.87.

From this analysis it may be seen that the type of tension most significantly related to the adjustment of boys was that of lack of Sexual Satisfaction. The matter of Ascendance-Submission came next. The matter of Consideration came third. These were the only three items showing a significant relationship to the adjustment of boys (see Table 2).

Findings concerning the five most significant tensions in relation to the adjustment of the 34 girls are shown in the following analysis of data:

1. In the 20 cases where tension over lack of sexual satisfaction existed one girl, or five per cent, was satisfactorily adjusted, while 19 girls, or 95 per cent were poorly adjusted. In the 14 cases where no tension on this point occurred, 12 girls, or 86 per cent were satisfactorily adjusted, and two, or 14 per cent, were poorly adjusted. The coexistence of this tension with the adjustment of girls was, therefore, 91 per cent. The critical ratio was 7.69.

2. Tension over lack of consideration occurred in 18 of the 34 cases.

TABLE 2
COEXISTENCE RATIOS AND CRITICAL RATIOS OF DIFFERENCES IN PROPORTIONS OF SATISFACTORY ADJUSTMENT OF BOYS COEXISTENT WITH THE FIVE MOST SIGNIFICANT INTERPARENTAL TENSIONS

Inter-parental tensions	Parental tensions existed				Parental tensions absent				Diff. of propn.		Coexistence ratio
	Total Cases	Satisfactory	child adj.		Total Cases	Satisfactory	child adj.		Amt. of diff.	Sigma	
	N	N_p	N	P	N	N_p	N	P	$P'-P$	$P'-P'$	
Sexual relations	30	5	.167	.068	12	10	.833	.107	.666	.123	.83
Ascendancesubmission	19	1	.053	.051	23	14	.609	.102	.556	.114	.78
Consideration	20	2	.100	.067	22	12	.545	.106	.445	.125	.72
Affection	19	3	.158	.084	23	12	.522	.104	.364	.133	.68
Inability to talk through	27	6	.222	.080	15	9	.600	.126	.378	.149	.69

Of this number only one girl, or 6 per cent, was satisfactorily adjusted, and 17, or 94 per cent, were poorly adjusted. In the 16 cases where no tension existed, 12 girls, or 75 per cent, were satisfactorily adjusted, and the remaining two girls, or 25 per cent, showed poor adjustment. The coexistence ratio was 85 per cent, and the critical ratio 5.75.

3. In the 24 cases where tension over inability to talk satisfactorily through differences existed, six girls, or 25 per cent, showed satisfactory adjustment, and 18, or 75 per cent, showed poor adjustment. In the 10 cases where this tension was absent, 7, or 70 per cent, showed satisfactory adjustment and the remaining 3, or 30 per cent, showed poor. The coexistence ratio was 73 per cent and the critical ratio was 2.66.

4. Tension over lack of expressed affection was felt in 18 of the 34 cases, and of these 18 cases two, or 11 per cent, of the girls showed satisfactory adjustment while 16, or 89 per cent, showed poor adjustment. In the 16 cases where no tension occurred, 10 of the girls, or 63 per cent, showed satisfactory adjustment and six girls, or 45 per cent showed poor adjustment. Therefore, the ratio of coexistence was 76 per cent, and the critical ratio was 3.62.

5. In the 16 cases where tension over ascendance-submission relationship existed, five, or 31 per cent, of the girls were satisfactorily adjusted, while 11, or 69 per cent, were poorly adjusted. In the 18 cases where this tension was absent, eight girls, 44 per cent showed satisfactory adjustment, and 10, or 56 per cent showed poor adjustment. The ratio of coexistence here was 58 per cent and the critical ratio 0.79.

Here again sexual satisfaction is shown to be the most significantly related tension. The lack of consideration falls in second place and the lack of affection third. Tension over inability to talk did not show a significant relationship to the adjustment of girls, and neither did tension over the ascendance-submission relationship (see Table 3).

The foregoing analysis shows that the coexistence ratio and the critical ratio for each item of tension, except that of ascendance-submission, is higher in the case of girls than in the case of boys. This might indicate that girls could be more significantly affected by parental tensions than boys. However, as shown on Table 4, the critical ratios of differences in proportions of satisfactory adjustment of boys and satisfactory adjustment of girls coexistent with interparental tensions are less than three in each item. Therefore, the difference in proportions of satisfactory adjustment of boys and satisfactory adjustment of girls coexistent with interparental tensions is here shown to be of no significance statistically.

TABLE 3
COEXISTENCE RATIOS AND CRITICAL RATIOS OF DIFFERENCES IN PROPORTIONS OF SATISFACTORY ADJUSTMENT OF GIRLS COEXISTENT WITH THE FIVE MOST SIGNIFICANT INTERPARENTAL TENSIONS

Inter-parental tensions	Parental tensions existed					Parental tensions absent					Diff. of propn.			Coexistence ratio
	Total Satisfactory child adj.					Total Satisfactory child adj.					Amt. of diff.			
	Cases <i>N</i>	<i>N_p</i>	Propn. <i>P</i>	Sigma <i>P</i>		Cases <i>N</i>	<i>N_{p'}</i>	Propn. <i>P'</i>	Sigma <i>P'</i>		<i>P-P'</i>	<i>P-P'</i>		
Sexual relations	20	1	.050	.048		14	12	.857	.094		.807	.105	7.69	.91
Consideration	18	1	.055	.054		16	12	.750	.108		.695	.121	5.75	.85
Affection	18	2	.111	.074		16	10	.625	.121		.514	.142	3.62	.76
Inability to talk through	24	6	.250	.088		10	7	.700	.144		.450	.169	2.66	.73
Ascendance-submission	16	5	.313	.116		18	8	.444	.117		.131	.165	.79	.58

TABLE 4
CRITICAL RATIOS OF DIFFERENCES IN PROPORTIONS OF SATISFACTORY ADJUSTMENT OF BOYS AND GIRLS COEXISTENT
WITH INTERPARENTAL TENSIONS

Inter- parental tensions	Boys				Girls				Diff. of propn.		Critical ratio
	Total		Satisfactory child adj.		Total		Satisfactory child adj.		Amt. of diff. $P-P'$	Sigma $P-P'$	
	Cases N	N_p	Propn. P	Sigma P	Cases N	$N_{p'}$	Propn. P'	Sigma P'			
Sexual relations	30	5	.167	.068	20	1	.050	.048	.117	.083	1.41
Consideration	20	2	.100	.067	18	1	.055	.054	.045	.056	.52
Inability to talk through	27	6	.222	.080	24	6	.250	.088	.028	.119	.23
Affection	19	3	.158	.084	18	2	.111	.074	.047	.112	.42
Ascendancy- submission	19	1	.053	.051	16	5	.313	.116	.260	.127	2.03

INTERPRETIVE COMMENTS

The fact that there is a high coexistence between a certain item of parental tension and poor child adjustment, does not prove that the tension is a causative factor in the child's unadjustment. However, in interpreting the association of parental tensions with child adjustment, a causal relationship may be assumed. The fact that the child under school age has lived in closest contact with his parents, and with limited outside contacts, would logically lead to the widely accepted assumption that the environment of the home has integrally influenced his development and behavior. Furthermore, since this environment has intrinsically included the harmonies and disharmonies between the two people closest to him, their relationship would presumably have impinged itself onto his growing personality.

Drawing conclusions, then, as to findings in the present study, it may be said that tensions shown to have high coexistence with poor child adjustment played the greatest rôle in bringing about poor adjustment. The five significant tensions were: tension over sex satisfaction, tension over lack of consideration, inability to talk things through, tension over insufficient expression of affection and tension over the ascendance-submission relationship.

The constellation is an interesting one. It raises several questions and points to possible interpretations.

Why, for instance, did the cases where sex tensions were present in the parents show an appreciably greater proportion of poor adjustment in the children than did cases where there was disharmony over leisure pursuits, for instance, or over finances? Why did the tensions over sex and affection and consideration appear to be those having such a high degree of association with poor child adjustment? Why did tension over ascendance-submission also appear so significant? Do these various factors fit together? How does inability to talk things over fit into the picture? Looking at these five significant factors—sex, affection, consideration, ascendance-submission and inability to talk things over—does their sum total point to any sort of explanation or interpretation involving *all* the factors and integrating their significance?

When these tensions are examined, the fact appears that sex, affection, and consideration are closely related. (They went together in two-thirds of the cases.) These are satisfactions that bring personal, security-giving warmth and closeness into a marriage. Moreover, they are intrinsically interdependent. A couple, for instance, who give each other sexual satis-

faction may well tend to be affectionate with each other. (In the 23 cases where sexual satisfaction was mutual, 20 couples reported that they also were satisfied with each other in regard to the giving of affection). Similarly where there is sexual satisfaction there is also apt to be consideration given. (Of the 23 cases where sex satisfaction existed, 22 accorded each other consideration). But, conversely, a couple who does not give each other sexual satisfaction may well tend to withhold affection. They may well hit out at each other and become inconsiderate. Or, if one partner lacks consideration, the other may tend to punish by withholding sex. This, in turn, may block affection for fear that it might lead on to sexual advances. (This the qualitative data frequently showed). Inconsideration would then quite naturally follow.

In short, sexual expression and the expression of affection and consideration, are so closely allied that they run into each other, as it were, and merge. They are all three basically security-giving factors. They are factors which bespeak the warm personal elements in the two partner's relationship to each other.

In contrast, ascendance is an adequacy-giving matter. The struggle to be ascendant rather than submissive is a struggle for achievement or power.

Thus, in the tensions which were found most significant in relation to child adjustment, the two most basic types of human emotional satisfactions seem to be touched. People crave security. They crave adequacy. Sexual and affectional satisfactions, in both of which consideration plays its part—these contribute basically to the partners' deepest sense of security. Ascendance-submission, on the other hand, can deeply disturb the basic need for adequacy. Denial of either security-giving or adequacy-giving satisfactions is bound to bring conflict. Where there is denial of closeness and denial of power, trouble is bound to eventuate.

A lack of ability to talk things through probably follows these other items and arises out of them. It is also a factor which intensifies the others. It is, after all, impossible to work out the other items as long as a couple cannot talk conflicts through. A vicious circle results. A feeling of insecurity—brought about by lack of sex satisfaction, affection, and consideration—and a feeling of inadequacy, reduce confidence to the point that a couple cannot get together. But, in turn, not getting together and talking things out only makes difficulties pile up.

Present-day theory is that feelings of security and adequacy are basic needs. The present findings fit in with what has been said by various au-

thorities. Travis and Baruch,³ after a review of the literature, state: "As we struggle on—day in, month out—much of our struggling is directed at obtaining the kinds of satisfaction which bring to us feelings of security and adequacy" (p. 79).

The data in the present study fit in with the above. From these data one can conclude: First, that those factors which constitute close, warm security-giving satisfactions to married people are the most important factors in their relationship to each other (i.e., sex, affection, and consideration). Second, that following closely in importance are factors which tend to produce adequacy in building up rather than destroying ego (i.e., ascendancy-submission). And third, that where these security-giving and adequacy-giving satisfactions are denied, people tend to shut in and not talk things through, which in turn intensifies the picture.

Using somewhat different terminology to highlight the conclusions: The *Affectional* and *Ego* values are the essential values in the marriage relationship. Any hurt to these hurts the total relationship. It makes the partners shut in and hit out at each other. It is so intense that it impinges on the adjustment of the children involved in the situation.

It is obvious that the other tensions investigated did not bear as closely or fundamentally on affectional or ego values within the marriage relationship. Other tensions occurred as frequently, and yet their weight did not impinge significantly on child adjustments. Thus, tension over leisure pursuits was reported in 38 cases, whereas tension over affection was reported in 37. Tension over work was reported in 41 cases, whereas that over consideration was reported in 38 cases. And yet, neither tension over leisure nor tension over work yielded significant coexistence with child adjustment.

It is also possible that since the items not significantly related to child adjustment (criticalness, leisure pursuits, work, friends, etc.) were not items bearing closely on affectional or ego satisfactions, they would consequently not be so difficult to verbalize about. One partner would therefore be more readily able to communicate to the other his feelings about these items—he could thus talk and "let out" and therefore prevent an excessive "piling up" of resentment. The fact that resentment was then let out would reduce or dilute the pressure of these tensions on both the partners and the child.

Further findings in this study indicate that there is no significant relation-

³For further statements as to what types of satisfaction bring security and bring adequacy, see pp. 63 to 83 in Travis and Baruch, *Personal Problems of Everyday Life*. It will be noted that affection is listed as basic to security (see Table p. 80).

ship between proportions of satisfactory adjustment of boys and of girls and interparental tensions.

It was found, however, that more tensions appear to impinge on girls than on boys. This may indicate that parents are already, in the preschool years, tying girls closer than they are boys. This, in turn, points to the fact that, in the present generation of girls, there is beginning all over again a condition which Baruch (1), in her study of background factors, found prevalent in the mothers of these children. In her sampling, the women appeared to have been more significantly influenced by their own parents' marital adjustment than did the men.

SUMMARY

A study was undertaken of 76 children and their parents in the preschool laboratories, Broadoaks School of Education, Whittier College. Ages of the children ranged from one year, six months to five years, seven months at the beginning of the cases, with a mean age of three years, three months; and at the close of the cases from two years, six months to six years, one month, with a mean age of four years, six months. The average number of semesters during which the cases were in progress was 2.8. The parents had been married from five to 17 years, the average length of marriage being 8.3. The children were superior intellectually (mean *IQ* 122). The parent group likewise was a superior one, the majority being college graduates, with occupational status of the fathers falling, in all but five cases, in the two highest classes of the *Sims' Scale*.

The purpose of the study was to discover: (a) To what degree child adjustment coexists with parental tensions in this sampling of 76 cases. (b) Whether satisfactory adjustment coincided in boys to a higher degree than in girls, or vice versa, in instances where the five most significant tensions were reported present.

Children were observed in the preschool, their problems recorded, and their adjustment rated. Reports were obtained from homes on problematic behavior to supplement school records.

Comparable data on the interparental relationships were secured from fathers and mothers of 65 children and from mothers of 11, on tensions present in the interparental relationships and on background items in the lives of the parents. Procedure was that of free interview of the psychiatric social-work type, in which rapport in the relationship of investigator to parent was recognized as an important factor in freeing the parent sufficiently

to give expression to intimate details concerning his life. In general, findings were:

1. Certain of the items reported in the interparental relationships were significantly related to child adjustment. These were: Tensions over sex, over lack of consideration, over inability to talk over differences to mutually acceptable solution, tension over lack of expressed affection and over ascendance-submission.

2. The following items reported in the interparental relationships did not appear significantly related to child adjustment: Tension over lack of coöperation on the upbringing of the child, extramarital relations, tension over health, over friends, over work, over relatives, leisure pursuits, criticalness of the partner, tension over finances, and over differences in tastes.

3. Of the five tensions significantly related to child adjustment, only three were found to be significantly related to the adjustment of boys alone. These were: Lack of sexual satisfaction, ascendance-submission, lack of consideration.

4. Of the five tensions significantly related to child adjustment, only three were found to be significantly related to the adjustment of girls alone. These were: Lack sexual satisfaction, lack of consideration, and lack of affection.

5. In every item, except that of ascendance-submission, the coexistence ratio and critical ratio were higher for girls than for boys, which would indicate that girls might be more significantly affected by parental tensions than are boys.

6. The difference in proportions of satisfactory adjustment of boys and satisfactory adjustment of girls coexistent with parental tensions is here shown to be of no significance statistically.

In addition to these findings, there were some indications pointing toward the following:

7. In general the degree of tension seemed inversely related to the degree of free verbalization possible to the partners relative to a tension-producing item.

8. The types of tension appearing most significant were those which seemed most closely and fundamentally related to affectional and ego values lying within the relationship of one partner to the other.

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SHORT ARTICLES AND NOTES

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STUDENT OPINION ON THE IMPORTANCE AND ATTAINMENT OF COURSE OBJECTIVES IN PSYCHOLOGY*

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Although a formulation of a set of objectives is a vital part of good instruction, the evaluation of such goals in objective terms is a very difficult task. An obvious means of evaluating course objectives is to obtain student reactions, but the results must not be trusted too far since student opinion may not be as objective and impartial as might be desired.

In a previous study (1) it was found that student opinion of the degree of attainment of objectives set up for a beginning Psychology course appeared to be consistent with the obvious emphases made by the instructor in the class. Also, student opinion concerning a course is a factor to be taken into consideration if teaching is to be effective—regardless of the validity of the opinion. The present study was undertaken for two particular purposes: first, to check up on the previous opinion sample; and second, to get student opinion on the relative importance of course objectives as well as on the attainment of these objectives.

A class of 110 freshman and sophomore women, who were just finishing their first course in Psychology, were used as subjects. They were asked to rate 15 course objectives as to how important they were, and as to how well they had been met. The instructions explained that responses were to be anonymous, and that careful and critical thought was wanted. The following scheme was used in the rating of the importance of the objectives:

- 1 means that the objective is of *extremely great* importance.
- 2 means that the objective is of *considerable* importance.
- 3 means that the objective is of *moderate* importance.
- 4 means that the objective is of *slight* importance.
- 5 means that the objective is of *no* importance.

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TABLE 1
AVERAGE RATINGS OF IMPORTANCE AND ATTAINMENT FOR 15 COURSE OBJECTIVES

Objective	Importance		Attainment	
	Average	Rank	Average	Rank
A genuine effort toward self-improvement psychologically	1.3	1.0	2.0	2.0
Valid self-understanding. This would include discovery of genuine assets and liabilities; comprehension of the true basis of the attitudes of others; development of valid self-confidence and personal adjustment	1.4	2.5	2.6	13.5
Formation of sound judgments. This includes a critical attitude toward rumor and gossip, an insistence on command of facts before forming an opinion and restraint in forming strong likes and dislikes	1.4	2.5	2.1	3.0
Emotional control. Progress toward the understanding of emotional causes and effects and toward the elimination of merely impulsive action	1.5	4.0	2.3	5.5
Intelligent planning. This would include objective analysis of abilities and interests; consideration of remote as well as immediate consequences of decisions; reliable estimates of the relative values of various courses of action	1.6	6.0	2.7	15.0
Development of a sympathetic understanding of the faults and peculiarities of other people. An objective attempt to understand the real causes of the faults of others, and a considerate acceptance of such persons rather than prejudiced behavior toward them	1.6	6.0	1.9	1.0
Recognition of your own prejudices and a genuine effort to minimize their undesirable effects	1.6	6.0	2.4	9.0
Assumption of the responsibility for one's own actions decisions and limitations	1.7	8.0	2.4	9.0
Reasonably good and reasonably rapid adaptation to changes in environment	1.8	9.0	2.5	11.5
Reaction to others on the basis of the whole personality rather than on the basis of a single prominent trait	1.9	10.5	2.3	5.5
Recognition of the prejudices of others, especially the ability to recognize and discount "stereotypes," and the ability to evaluate statements of others on the basis of their soundness rather than on the prestige of the person who makes the statement	1.9	10.5	2.4	9.0
Friendly interest in people without imposing your own personality upon them	2.0	13.0	2.5	11.5
Differentiation between real explanation and mere description, and the ability to discriminate sound from faulty generalization	2.1	13.0	2.6	13.5
A development of interest in psychological is-				

TABLE 1 (*continued*)

Objective	Importance		Attainment	
	Average	Rank	Average	Rank
sues shown in reading and thinking beyond the required assignments. This would include news items and magazine articles which were appropriate, or it might include popular or technical books, or psychological novels	2.2	14.0	2.3	5.5
A development of interest in psychological issues shown in pertinent contributions to discussion groups and in attendance at lectures or study groups	2.3	15.0	2.3	5.5

In rating the attainment of objectives the following scheme was used:

- 1 means that the objective has been met in a *completely* satisfactory way.
- 2 means that the objective has been *very well* met.
- 3 means that the objective has been *fairly well* met.
- 4 means that the objective has been *only slightly* achieved.
- 5 means that the objective has been *missed* entirely.

Table 1 shows the average ratings made for importance and attainment. The table is arranged with the objectives receiving the highest average ratings for importance at the top.

The average for the ratings on importance is 1.75, which represents a judgment that in general these objectives are of "considerable" importance. In these ratings of importance, as in the earlier study of ratings of attainment, the objectives which receive the greatest emphasis in the course also receive the highest average ratings from the students.

The average for the ratings of attainment is 2.38. This represents a judgment by the group that the objectives are "very well met."

The rank order correlation between the two sets of ratings is only .22, with a probable error of .09. Inspection of Table 1 shows that although in many cases the ranks of the various objectives are reasonably close, there are many in which wide discrepancies occur. In these discrepancies lies a suggestion for the instructor. For example, the objective dealing with valid self-understanding has a rank of 2.5 in importance, but a rank of 13.5 for attainment. Obviously the students think this is an important issue which has not been particularly well met by the instructor. The objective dealing with intelligent planning ranks sixth in importance and fifteenth in attainment, and the objective dealing with sympathetic understanding ranks sixth

in importance and first in attainment. It is encouraging to see that no objective received an average rating as low as 3 for either importance or attainment, but it is likely that the Psychology course in question could be more effectively taught if these discrepancies could be minimized.

In comparing the ratings of attainment made in the first study and the same ratings made in this study, a rank order correlation coefficient of .55, with a probable error of .07, was found. This indicates that there is only a fair degree of similarity between the ratings of the two different groups of Psychology students taking the same course at different times. Obviously, the emphases and teaching methods of the course may have changed in the interval of about one year between the two samples, but how much this factor and how much the unreliability of the ratings lie behind this rather low coefficient is not known.

The two sets of ratings agree in that the objective dealing with sympathetic understanding was judged as best attained, and the objective dealing with effort toward self-improvement was judged as second-best attained by both groups. The widest discrepancies occurred for the objective dealing with pertinent contributions to discussion groups, and with the objective dealing with reasonably good and reasonably rapid adaptation to changes in environment.

Further analysis of the data was made by converting the ratings into the percentages awarded to each of the five categories for importance and for attainment, Table 2 shows these results.

TABLE 2
PERCENTAGES OF JUDGMENTS IN EACH CATEGORY

Rating	1	2	3	4	5	Total
Per cent importance						
Ratings	48.2	32.5	16.6	2.6	.1	100.0
Per cent attainment						
Ratings	19.7	37.6	32.6	8.7	1.4	100.0

It is clear from Table 2 that more than twice as many top ratings occur in evaluating the importance of objectives as occur in evaluating the attainment of these objectives. This indicates the need for increased effort on the part of the instructor for greater attainment of those goals considered most important by his students.

SUMMARY

For the purpose of checking up on a previous study of student opinion of the attainment of course objectives, and also for the purpose of obtaining information on student opinion of the importance of 15 course objectives, 110 college women who had just completed their first course in Psychology were asked to make two series of ratings. Results indicated only fair agreement between the two groups in ratings of attainment, and also that there were some rather wide discrepancies between ratings of importance and ratings of degree of attainment for certain objectives.

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A STUDY OF THE VIEWPOINTS OF WOMEN OF DIFFERENT AGE GROUPS*

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A. INTRODUCTION AND PURPOSE

The purpose of this study was to secure first-hand information, as to the viewpoint of women, first on domestic problems, and second, on the desirable characteristics of a husband. Data were collected by means of a questionnaire from a large group of women of a wide age range, but closely comparable in social and intellectual status. The results show differences in crystallization of opinion on their own status, yet consistent unanimity on the qualifications of a husband.

B. TESTS, PROCEDURE, AND SUBJECTS

The questionnaire was a single sheet with a scale of values numbered from 1 to 9, as follows: Greatest possible favor, very great favor, moderate favor, neutral, moderate disfavor, great disfavor, very great disfavor, intolerable. Each person rated the proposition by selecting one number from the scale of values.

The first page bore 10 propositions concerning domestic relations: (a) That a wife should have the chief direction and control of the organization and routine of life in the home as the husband has in his business; (b) that a wife should drop any former dreams of a career which she may have had and devote herself entirely to her family and the career of her husband; (c) that children should be so trained that by the time they have passed out of their teens they should be responsible and independent individuals, looking to the parents perhaps for counsel, but free from parental domination and restraint; (d) that a wife should keep herself informed on current affairs, even though minor matters of good housekeeping must be neglected in order to do so; (e) that a mother should interest herself in

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¹For a full discussion of the results the reader should consult the writer's Master's thesis, "A study of the viewpoints of women of different age-groups" which is on deposit in the University of Oregon Library.

civic affairs and take an active part in them in order to safeguard the environment in which her children develop, even though minor matters of good housekeeping must be neglected in order to do so; (*f*) that a wife should be content to trust to the judgment and generosity of her husband in money matters, and should not expect an independent allowance, checking account, or other such provision for her own or family needs; (*g*) that the same code of morals, including sex relations, be binding on husband and wife; (*h*) that in cases where the tastes of husband and wife differ radically as to the form of entertainment enjoyed, each should be free to follow individual choice as a rule; (*i*) that a wife should subordinate her theories of diet for the family, and of the cooking and serving of food, to the preferences of her husband in such matters; (*j*) that a woman who has pursued a business or professional career before marriage should, if she so chooses, continue to pursue it after marriage.

On the second page of the questionnaire were listed 38 traits of personality to be rated as to their desirability as characteristics in a husband. The scale of values for this part follows: 1, indispensable; 2, extremely desirable; 3, very desirable; 4, moderately desirable; 5, irrelevant; 6, moderately undesirable; 7, very undesirable; 8, extremely undesirable; 9, greatest possible disfavor.

Traits of husband: 1, good health; 2, neatness; 3, college education, 4, recognized ability as a leader; 5, variable emotionality; 6, fondness for good literature, etc.; 7, member of established church; 8, companionable in the home; 9, considerate in the home; 10, desiring children; 11, willing to help in their rearing; 12, adaptable to family life; 13, perseverance; 14, creative thinker; 15, courageous; 16, ready to use shady practices in business; 17, social ease; 18, unvarying honesty; 19, respectful toward women; 20, optimistic; 21, sarcastic toward women; 22, keen sense of humor; 23, indifferent to religious matters; 24, generous toward family needs; 25, extremely conscientious in details; 26, readiness in making friends; 27, rational in decisions; 28, reckless and daring; 29, retiring disposition; 30, highly intelligent; 31, credulous; 32, habitual repression of emotions; 33, romantic views of life; 34, enthusiastic in his interests; 35, phlegmatic temperament; 36, parsimonious; 37, habitually patient; 38, devoted to some sport. High school seniors, 16-18 years of age, were chosen as the lowest age-group; college juniors and seniors made up the second group. Names from student-body files of women listed as out of college five to ten years comprised the third group. Mature and older groups were reached through names taken from year-

books of the federated clubs of the State of Oregon, and a few scattered individuals known to the writer as being progressive and mentally alert, were also included. The oldest woman contacted was 84 years of age.

There were 530 cases of completed returns, classified in five age-groups as given in Table 1. Since different numbers of individuals reported in the

TABLE 1

Age	Number	Description	Symbol
16-18	113	High school seniors	HS
19-24	114	College juniors, seniors	Col
25-35	124	Out of college 5-10 years	OC
36-50	94	Mature women	M
51-84	85	Elderly	E

different groups, the curve for each was plotted on a percentage basis in order that they might be directly comparable.

C. RESULTS

Table 2 gives the mean scale values and the average deviations for the five age groups on the 10 propositions.

TABLE 2

	HS	ad	Col	ad	OC	ad	M	ad	E	
I	3.00	1.34	2.54	1.22	2.35	1.08	2.08	1.12	2.08	1.05
II	5.51	2.00	5.44	1.84	5.25	1.79	4.66	1.69	4.47	1.33
III	2.36	1.40	2.76	1.63	2.09	1.20	2.04	1.16	2.53	1.27
IV	3.59	1.67	2.96	1.32	2.12	1.04	2.10	.93	2.30	1.12
V	3.50	1.51	3.00	1.30	2.12	1.04	2.23	1.06	2.49	1.30
VI	6.35	2.07	7.71	1.45	7.98	1.09	7.88	1.19	7.27	1.61
VII	1.89	1.07	1.34	.56	1.62	1.08	1.13	.24	1.14	.25
VIII	4.62	2.18	4.82	1.98	4.31	2.05	4.04	1.75	3.36	1.59
IX	6.13	1.60	6.83	1.44	7.15	1.43	6.87	1.44	6.13	1.35
X	4.65	2.12	5.17	2.06	4.73	1.98	4.67	1.69	4.76	1.70

An inspection of the means shows that some items like III and VII tend to receive low scale values, while others like VI and IX obtain high (unfavorable) ratings from all groups. This fact indicates that the scale of values was employed with some precision and consistency by all ages.

In passing from group to group up the age-scale there is found a steady shift toward a greater consideration for the status and ability of women, especially in Items II, IV, V, VII, and VIII. The item receiving the most disfavorable rating is VI, Dependence in money matters. All groups are agreed as to its undesirability, but OC, ages 25-35, rated it lowest, the aver-

age score being 7.98. Many of these women were, or had been, wage-earners, and took most unkindly to dependence for financial needs. The most favorable rating of the 10 problems was given to VII, a single moral standard. Here the average scale values ranged around 1.34.

An interesting comparison of the attitudes of the entire group may be seen in the ratings given Problems II and X, the former being a question of a wife's dropping dreams of a career in favor of devotion to home and husband, the latter, one of freedom to pursue a career already established. To II the three younger groups record a neutral attitude, while *M* and *E* are mildly

TABLE 3

	HS	Col	OC	M	E
1.	1.6	1.6	1.9	1.9	1.9
2.	1.4	0.8	2.1	1.9	2.2
3.	3.0	3.3	3.5	3.7	3.9
4.	3.8	3.7	3.8	3.9	4.1
5.	6.5	6.7	6.8	7.7	4.1
6.	3.2	2.0	3.0	2.7	3.0
7.	4.0	4.2	4.2	4.0	3.7
8.	1.5	1.4	1.5	1.7	1.7
9.	2.0	1.9	1.8	1.8	1.9
10.	3.8	2.5	2.3	2.5	2.7
11.	2.8	2.0	1.6	1.9	2.1
12.	2.5	2.2	2.0	2.0	2.3
13.	2.3	2.2	2.0	1.0	1.8
14.	2.7	2.8	3.1	3.2	2.0
15.	2.2	2.4	2.2	2.3	2.2
16.	8.8	9.4	9.4	9.8	9.6
17.	2.3	3.0	3.4	4.2	3.6
18.	1.6	1.8	1.5	1.5	1.5
19.	1.5	1.6	1.4	1.6	1.6
20.	2.8	2.2	3.3	2.8	2.5
21.	7.4	8.4	8.7	8.0	9.0
22.	3.9	3.0	2.8	3.0	3.0
23.	6.5	8.0	7.1	8.3	8.1
24.	3.1	3.0	2.7	2.8	3.0
25.	3.9	4.6	4.2	4.0	2.9
26.	2.9	3.3	2.5	4.0	3.5
27.	3.7	3.6	2.2	2.3	2.2
28.	7.4	7.4	7.8	8.3	8.0
29.	7.3	9.0	9.0	7.2	7.1
30.	3.8	3.0	2.5	2.2	2.9
31.	7.5	9.0	9.0	7.0	9.0
32.	7.6	8.2	8.3	7.2	7.9
33.	4.5	5.4	5.0	5.4	5.6
34.	4.0	3.2	3.1	2.5	3.5
35.	7.3	7.7	7.4	7.3	6.8
36.	8.0	9.0	9.2	9.8	9.7
37.	4.2	4.0	3.7	3.5	3.5
38.	4.2	3.5	4.0	4.2	4.5

in favor of dispensing with dreams. For X there is an irregularity of mean scores throughout the scale, but all are near the neutral point. Apparently all ages are willing to leave it up to the person who makes the choice. It is the oldest group who show the most favor toward dropping dreams, and as a group they are less inclined to approve the continuation of a career which was in actual practice before marriage.

Inspection of the average deviations for all ages reveals a definite trend: the variability decreases with age. This would seem to indicate a progressive crystallization of opinion due to increasing experience of life.

In evaluating the returns from page 2 the mean scores were found as for those of page 1 (Table 3).

The most conspicuous feature of the study as a whole is the close agreement upon most points of the women reporting here. The conclusion is that the social environment of the moment was of greater weight in determining answers than was any difference in age, the variations between age-groups being usually one of relatively small degree.

There is close agreement upon the traits essential in an ideal husband. These are, first of all: A respectful attitude toward women, then Companionable in the home, of Unvarying honesty, Neat in personal appearance, and of Good health. Furthermore he must be free from Willingness to resort to shady practices in business, from Niggardliness in spending for a family, from credulity, and from a Sarcastic attitude toward women. Recklessness and Habitual repression of emotions in the home are equally undesirable, and indifference to all religious matters is likewise in extreme disfavor. An inspection of this section shows little change from group to group.

D. SUMMARY AND CONCLUSIONS

Judgments of 530 women were obtained on a questionnaire. The results indicate that ideas about the status of women vary with age, becoming more fixed and uniform in the older groups. Ideas about a husband, however, remain fairly fixed and constant regardless of age.

The most conspicuous feature of the study as a whole is the close agreement of women of all age-groups upon the subject matter here presented.

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THE PLACE OF WAR TOYS IN THE PRESENT EMERGENCY*¹

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This project was undertaken for two purposes: first, to obtain some kind of even tentative answer to the question of the advisability of war toys for children, and secondly, to see how a group of professional psychologists in the applied field would respond to a problem on which they had no ready access to a body of research data. A preliminary population of 20 psychologists, whom I judged would be interested in a question of this type and whose background of professional work would give them some experience for answering, were first sent the questionnaire, as printed herewith (Table 1). After receiving the responses from 13 of these 20, I made a random selection of 80 more psychologists chosen from the membership list of the American Association of Applied Psychologists. From this latter group of 80, 56 replies were received. From the 100 questionnaires sent out, a total of 69 replies were received, which constitute the data of this report.

The following introductory statement was included with the questionnaire:

Civilian defense and civilian morale are topics of the highest importance today. Children's attitudes, fears and opinions of the war and war activities are important as part of this general problem of civilian morale during the war.

Therefore, the advisability of giving children war toys in their play is a practical problem and one that comes up for consideration by many parents and administrators. With toy manufacturers turning out vast quantities of guns, tanks, airplanes, bombs, lead soldiers, etc., the problem is already in existence. For instance, at Mooseheart—the community which my Laboratory serves—there is a large supply of various kinds of toys sent to the children. How advisable is it to stress gifts of war toys or how wise to discourage that type of toy? Since there is virtually no literature on war toys, I am asking a group of clinical and child psychologists to give their opinion on the matter by means of the enclosed questionnaire. We realize that the question of the advisability of war toys must be decided by the peculiarities of the given child confronting us, his personality, age, sex,

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TABLE 1
OPINION QUESTIONNAIRE ON WAR TOYS

Check <i>A</i> if you agree with the particular statement.			
Check <i>D</i> if you disagree.			
Check ? if you are undecided.			
1	<i>A</i>	?	<i>D</i> War toys, by acquainting children with the mechanics of war, tend to make them less fearful of war since the most irrational fears are fears of what is unknown.
2	<i>A</i>	?	<i>D</i> War toys are definitely detrimental and instill in children the viciousness of war.
3	<i>A</i>	?	<i>D</i> The effect of war toys is negligible, one way or another.
4	<i>A</i>	?	<i>D</i> In these times, the best educational toys are war toys.
5	<i>A</i>	?	<i>D</i> War toys may serve to alleviate children's fears regarding military invasion or bombing.
6	<i>A</i>	?	<i>D</i> While war toys are not noticeably harmful, there are many other kinds of toys which are preferable.
7	<i>A</i>	?	<i>D</i> The effect of toys upon children's present attitudes has been very much overestimated.
8	<i>A</i>	?	<i>D</i> War toys are inconsistent with a pacifistic viewpoint.
9	<i>A</i>	?	<i>D</i> War toys serve a definite need in wartime since they are one of the least objectionable ways of introducing children to the facts of war.
10	<i>A</i>	?	<i>D</i> War toys are probably detrimental to children's mental health.
11	<i>A</i>	?	<i>D</i> War toys tend to recondition and rationalize any fears the child may have with respect to war.
12	<i>A</i>	?	<i>D</i> The educational value of war toys is negligible.
13	<i>A</i>	?	<i>D</i> War toys might possibly serve the function of giving the children symbolic expression for their aggressive urges.
14	<i>A</i>	?	<i>D</i> War toys give children a keener realization of the events of the world today.
15	<i>A</i>	?	<i>D</i> War toys tend to develop a militaristic attitude.
16	<i>A</i>	?	<i>D</i> The effect of toys upon children's attitudes when they become adults is virtually negligible.
17	<i>A</i>	?	<i>D</i> War toys are unqualifiedly bad for children to have.
18	<i>A</i>	?	<i>D</i> Since the radio, the newspapers, and the conversation of adults are full of reports of bombings and military engagements, it would be advisable for parents to acquaint children in a rational way about war activities through war toys.
19	<i>A</i>	?	<i>D</i> War toys as such are neither better nor worse than any other kind of toys.
20	<i>A</i>	?	<i>D</i> War toys are primarily toys and have no effect whatever upon children's attitudes toward war.

etc This being obvious, however, the practical problem remains. We, as psychologists, individually and as a group, are asked the question by parents, institutions, and school administrators: Is it advisable to use war toys in the present crisis with "normal" children? It is for the sake of getting some orientation for ourselves as a group that the following questionnaire has been prepared. We shall welcome individual comments and qualifying statements, in addition to the questionnaire.

Realizing that your time is limited and yet desiring some even tentative answer to this question, I would very much appreciate your filling out the enclosed questionnaire and returning it to me as soon as it is conveniently possible.

The 69 replies received were tabulated for each question under the three possible answers: agreement, indecision, and disagreement, and a few of "no reply" at all. Unwillingness or failure to answer may be interpreted as indecision; however, the responses tabulated as "undecided" in this report were definitely marked that way.

Since an "undecided" category was permitted, the degree to which a particular statement was approved depended upon whether the count was made using the "agreement" category or the "disagreement." In order to determine how closely these two categories agreed in their rating of the amount of agreement or disagreement on a particular statement, the questions were ranked from those having the highest agreement to those having the lowest agreement, using the *A* category, and then they were again ranked from those having the lowest disagreement to those having the highest disagreement, using the *D* category. From these two orders, a rank difference correlation was computed and found to be .82. Inspectional analysis revealed that the greatest rank difference magnitudes were found among those questions which had the highest proportion of undecided responses, as might be expected.

To get some measure of the group's opinion, it was decided to use no greater statistical refinement than the simple requirement that a majority of the group would have to subscribe to the particular point of view on a particular question. Using this criterion, only 7 of the 20 questions gave any relatively clear group opinion. These were questions 2, 4, 6, 7, 10, 13 and 17. It should be noted that a number of these are extreme, all inclusive statements or else include conditional hedging words like "probably," "might possibly," etc. However, from these we may say that this group does not think that war toys are unqualifiedly bad for children to have nor that war toys are definitely detrimental and instill in children the viciousness of war, nor even that they are *probably* detrimental to children's mental health. However, neither do they agree with the statement that in these times the *best* educational toys are war toys. Instead, they think that while war toys are not noticeably harmful, there are many other kinds of toys which are preferable. They say in their majority opinion that war toys might possibly serve the function of giving the children symbolic expression for their aggressive urges but believe that the effect of toys upon children's attitudes have been very much over-estimated.

If we use as our standard of group opinion the placement of a question in the extreme quartiles on a scale of agreement according to both the *A* and

D categories, then to the seven questions already summarized may be added question (1) on which the group agreed that war toys, by acquainting children with the mechanics of war, tend to make them less fearful of war since the most irrational fears are fears of what is unknown. Questions which almost secured majority backing were 1 (already mentioned), and, in addition, 8, 14, 18, and 20. Thus we might say that the group tended toward the view, but not without appreciable dissention, that war toys tend to give children a keener realization of the events of the world today but that they are, of course, inconsistent with a pacifistic attitude. (It might be questioned whether a pacifistic attitude is at all compatible with the events in the world of today.)

The group tended to agree that since the radio, the newspapers, and the conversation of adults are full of reports of bombings and military engagements, it would be advisable for parents to acquaint children in a rational way about war activities through war toys and tended to disagree that war toys are primarily *toys* and have no effect whatever upon children's attitudes toward war.

The greatest amount of indecision, as shown by a proportion of undecided responses higher than that of either of the other two categories, was found for Questions 3, 11, 15, and 16.

The group would not commit itself on whether the effect of war toys is negligible one way or the other, and they were undecided whether the effect of toys upon children's attitudes when they became adults was virtually negligible. They were undecided about whether war toys tend to develop a militaristic attitude and were uncertain about whether war toys tend to recondition and rationalize any fears the child may have with respect to war.

Indecision, as measured by the absence of any clear majority either one way or the other or as measured by an almost equal distribution of replies to each of the three possible categories, was evidenced for Questions 5, 9, 12 and 19. The group is undecided about whether war toys may serve to alleviate children's fears regarding military invasion or bombing and about whether they serve a definite need in war time since they are one of the least objectionable ways of introducing children to the facts of war. Likewise, they could not definitely say whether the educational value of war toys is negligible, and whether war toys, as such, are better or worse than any other kind of toy. That, in extended summary, gives the direct results of the questionnaire.

The reactions of the 69 psychologists, as a professional advisory group,

on the general question of the advisability of war toys showed, I believe, the following: Out of a total of 1,380 possible responses, the group gave the "undecided" response or failed to give any response at all in 426 instances, or 31 per cent. This proportion of undecided responses, almost one-third, is high in view of the fact that many of the statements in the questionnaire have extreme phrases like "unqualifiedly bad," "no effect whatever," "definitely detrimental," and other weaker hedging phrases like "tend to develop," "probably," "might possibly," etc., which either by their extremeness in some instances should promote a definite answer and by their hedging nature in other instances encourage an answer, definite even if non-committal.

The fact that on only roughly one-half of the questions could we obtain any even reasonably clear answer is a further cause for raising the question of what psychologists would do when confronted with such a situation.

Of course, it must be realized that recommendations, such as this questionnaire call for, depend upon a full knowledge of each individual child, his age, personality traits, attitudes, etc. Generalities like "war is hell," "the science of psychology is comparatively young in the family of sciences," "much research remains to be done on a great many questions," and, even further, that "many of the members in the applied field have separate specialities, often very unrelated, in spite of the fact that they all come under the head of psychology," may serve as general excuses for many indecisive responses. Yet the fact remains that parents, school administrators, and commercial firms which manufacture war toys need information of this kind and we psychologists, on the basis of our experience, should be the best equipped of any professional group to give such information. This study is presented, therefore, as a definite problem with professional implications. It is merely a test case. With the present war and the great need of the nation in matters psychological, what are we to do when our advice and services are called for in questions on which we have no access to a sufficient body of research studies to give a complete answer? Should we hedge and hem and haw and avoid answering on the plea that there is not enough evidence one way or the other? The practical demands of the situation will force a decision and the question, as I see it, is whether psychologists will make the best answer, or guess, or will let that task and decision fall to someone less qualified.

The individual comments which I received in many instances showed a great deal of constructive thought on the subject as well as interest in it. The comments which we received included a spelling correction, references

to literature, an additional question supplied by a psychologist, the underlining and addition of qualifying words in the questions, etc., but in all cases serious thought was given the matter. For instance, the point was made by several psychologists that the question was not whether war toys were good or bad in themselves but rather whether the way in which they were used was such as to serve a good or a bad purpose. All toys were a means and as such could be used to good or bad ends. Now such a point of view is a genuine contribution to the problem and gives helpful advice with practical implications for this subject.

While, then, the present little study gives a good insight into the great variety of individual thinking and opinion among psychologists, this in itself should be a good promise for the future of our science. On the other hand, however, should any machinery be set up or how shall we meet questions of the kind here discussed to which the parents, practical educators, and others of the nation demand an immediate answer?

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SEASON OF BIRTH AND FAME*

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A recent note in this JOURNAL by Drs. Pintner and Forlano (1942, Vol. 61, pp. 81-86) brings up the question of the way in which the seasonal distribution of births is influenced by such factors as mode of life, diet, and birth rank. It also raises a question as to the relative parts played by *IQ* and physical vigor as elements in the attainment of fame.

Using material which they have profitably discussed before in other respects, Pintner and Forlano divide some 17,500 New York school children into four approximately equal groups on the basis of *IQ*'s. Plotting the results according to the method which I have employed (1), they find that the three lower groups show approximately the same seasonal distribution of births. A pronounced maximum in February or March is followed by a minimum in May or June. Then comes a minor maximum in August or September, and lastly a deep minimum in October or November. These three groups together give a curve which is essentially the same as that of the 1,343,000 births in New York City from 1915 to 1934 (p. 324).¹ Many other curves of birth show similar seasonal trends. As Pintner and Forlano rightly put it, they are "somewhat like many of Huntington's curves demonstrating his 'basic animal rhythm of reproduction.'"

The curve for Pintner's four thousand children with high *IQ*'s (115 or higher) is quite different from the three for lower *IQ*'s. From a minimum in midwinter it rises to a maximum in August and September with merely a hint of a secondary maximum in April. It is closely similar to the curve for about a million and a half children born in Massachusetts from 1910 to 1924 (p. 101). Curiously enough, however, it is quite different from a curve which I prepared on the basis of about 3,500 children with *IQ*'s of 130 or more (p. 324). Most of the children lived in New York City, but some in New Haven. They were born mainly from 1920 to 1930. The curve of births for this group of highly competent children is much like that of all children in New York City, as well as like Pintner's curves for

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¹Page references in the rest of this paper refer to *Season of Birth*.

relatively low *IQ*'s. It closely approximates what I have called the basic type for temperate climates. Thus we are faced by a *seeming contradiction* between my curve for New York and New Haven children having *IQ*'s of 130 or more with its maximum in March and April, and Pintner's curve of New York children having *IQ*'s of 115 or higher with its maximum much later, in August and September.

To dismiss such a contradiction as the result of mere accident would be unscientific. The fact seems to be that season of birth depends upon a complicated combination of physical, social, and economic conditions. The working out of these is likely to lead to results that are highly significant for society. In explanation of the divergence of the two curves for relatively high *IQ*'s, two possibilities might well be investigated. First, a series of curves according to birth rank (p. 342) shows that in 1935 in New York State first births showed a seasonal distribution of the same type as Pintner's high *IQ*'s. Later births, however, depart from this in such a way that third and fourth births together give a curve just about like the average for all births in New York City. The sixth and later births, show a still closer approach to the "basic animal rhythm." This seems to mean that the seasonal distribution of first births is greatly influenced by social and economic conditions such as date of marriage, summer vacations, and times when plenty of jobs give newly married young people confidence in the future. On the other hand, the season at which births as late as the sixth occur depends to a large degree upon the physical condition of the parents. Their powers of reproduction apparently increase according to the basic rhythm until a maximum is reached in June. Therefore, the most children are born in March. Inasmuch as data for birth rank are as yet available for only one year, too much stress must not be laid upon what has just been said. Nevertheless, there is considerable evidence that the seasonal incidence of first births differs from that of later births.

This makes it desirable to inquire into the possibility that the children in Pintner's group with high *IQ*'s may include an especially high percentage of first births. Mine, on the other hand, may be more evenly distributed. It is worth noting that first born children form an especially high percentage of the total number of children in the better sections of large cities. The larger a family in such a section becomes, the more likely it is to move to the suburbs. Thus the better sections of a city, especially the high schools, which are the places where one would expect the greatest number of high *IQ*'s include a great number of children from families of only one or two children.

Moreover, a study by Ellis (p. 296) and another by myself (p. 292) indicate that first born children, especially those in small families, have in the past been much more likely than the later born ones to win fame. This suggests, but by no means proves, that their *IQ*'s average higher. Even if such is the case, it does not necessarily mean greater innate ability. It may mean greater constitutional vigor because the mothers are nearer their best physical level when the first child is born than at any later time.

Still another possibility may help to explain the special quality of Pintner's curve for high *IQ*'s. In England (p. 349) I found that births among the population as a whole follow the normal seasonal rhythm with a maximum in the late winter or early spring and a minimum in the autumn. Births among the "landed gentry," on the contrary, follow an entirely different rhythm with a minimum in January or February and a maximum in August, almost the same as Pintner's high *IQ*'s. Another instance of the same thing is found in central Europe. There, too, the births among the people as a whole follow the normal rhythm. Those of the "princely families," however (p. 337), follow the same seasonal trends as those of the landed gentry in England and Pintner's high *IQ*'s. Again, a similar contrast is found between different parts of the United States (p. 116). Births in Connecticut and Massachusetts on one side of the country and northern California on the other show this same peculiar type of seasonal curve, whereas the rest of the United States departs from this in ways that are appropriate to the diverse types of climate. These facts suggest that in general the kind of curve shown by Pintner's high *IQ*'s with its maximum of births from July to September is associated with unusually high standards of living. Something about this mode of life, perhaps its nutritional standards, seems to be especially potent in overthrowing or neutralizing the effect of the basic animal rhythm which leads to a maximum of births in the late winter or early spring. Thus it appears that the significance and causes of a given seasonal distribution of births cannot be rightly understood until we take account of many factors including climate, diet, percentage of first births, social customs, and standards of living. The difference between Pintner's curve of high *IQ*'s and mine, and between his curves of high and low *IQ*'s may be due to some sort of unconscious selection of data whereby we have gotten hold of relatively small samples which contain different proportions of first births, or of suburban children, or of those living according to certain standards of living.

Let us turn now to the problem of fame in relation to season of birth. A quotation from Pintner and Forlano will put the matter before us.

Huntington . . . postulates a basic animal rhythm which influences the number of births at various seasons of the year. He finds, furthermore, that the births of persons of unusual genius conform to his basic animal rhythm. If we assume that children with high *IQ*'s are likely to make up the larger portion of eminent people of the future, it would be reasonable to suppose that a preponderance of births of such children should approximate Huntington's basic curve showing a maximum during the winter months of January, February, and March. Huntington does not find this to be the case. . . . (Moreover, our own) high *IQ* curve shows no peak for the winter months as it should do to conform to Huntington's hypothesis.

Two points in this quotation need clarification. First, although I have frequently used the word "genius" in *Season of Birth*, I have everywhere employed it in a qualified sense, as appears from the following (p. 291):

We shall test our previous conclusions by what we may call eminence, leadership, success, or even genius. Whatever the name may be, the thing that we want to investigate is the qualities which make a man stand out above his fellow. We want to find out how far such success depends on physical vigor in comparison with innate genetic qualities on the one hand, and training and opportunity on the other.

The thing to be noted is that when most of us discuss "genius," we are not necessarily discussing people who have high *IQ*'s. We are merely discussing people who were able to use their faculties in such a way that they attained a certain level of fame. The records of almost any college show that many men who stand at the top intellectually and have extraordinarily high *IQ*'s never make good. They are forgotten by the next generation, whereas men with only moderate *IQ*'s become well known. In other words although Pintner is right in assuming that "children with high *IQ*'s are likely to make up the larger portion of the eminent people of the future," it is not to be expected "that a preponderance of births of such children should approximate Huntington's basic curve showing a maximum during the winter months." Such approximation may occur, but it is not a necessary consequence of the facts now known.

The reason for this last statement is that many facts indicate that fame, especially the kind of fame that causes people to be commemorated in books of reference does not depend entirely upon mental endowment. It also de-

pende to a large extent upon physical vigor and upon the powers of work and concentration which normally accompany such vigor. Let us suppose for a moment that in a given population 100 persons with sufficient mental equipment to permit them to become well known leaders are born in March and 120 in July. How many of them will actually become known to fame? Even under the most favorable circumstances it is doubtful whether one in ten will thus succeed, and probably the ratio is far less. Let us assume that the two groups are alike in innate ability and also in all types of cultural advantages, including education, opportunities, and such physical matters as diet and medical care.

What, then, will determine the percentage who become famous? Judging by what one sees among ordinary college students and among people in general, the decisive factor will be largely the energy with which these people of otherwise equal potentialities go about their work. If the children of the present are like those of preceding generations, those born in February and March will on an average live at least three and a half years longer than those born in July, August, or September (pp. 174, 177). This figure of three and a half years is derived from a study of 39,000 persons who were born in the eastern United States. None of them died before the age of two years and most lived more than 20. Such longevity means that throughout life those born in the late winter or early spring are especially vigorous and energetic. How much difference this makes in their final achievements it is impossible to say. It seems clear, however, that such persons have a distinct advantage in the race of life. Therefore, even if five or even ten per cent more children with *IQ's* above 115 are born in August or September than in February or March, as in Pintner's sample, there would be nothing surprising if six, let us say of the three or four hundred March children got into *Who's Who* and only five of the August children. In fact the surprising thing would be the failure of some such result to appear.

Thus it seems to me that Pintner's results and mine do not disagree, but merely emphasize the complexity of the underlying physical and social conditions which determine the season of birth on the one hand and provide the background for fame on the other. In a brief note such as this, it is impossible to do more than touch on some of the complexities and possibilities of the problem. Enough has perhaps been said to emphasize the value of work such as that of Drs. Pintner and Forlano.

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THE SIMPLIFICATION TENDENCY IN REPRODUCING DESIGNS*

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GERTRUDE HILDRETH

Studies of developmental sequences in childish drawing (1, 2, 3, 5, 6) demonstrate the stages through which children tend normally to pass as they progress from the scribble stage to realistic drawing. Copying designs has proved to be a good mental test for children because outline drawings of geometrical forms and designs can be arranged in order of difficulty according to the average age at which children can reproduce them correctly. Copying designs, therefore, is a test that affords an opportunity to study the laws of psychological assimilation and apperception, and to determine the child's maturity in perception.

A simplification tendency is shown when children attempt to draw complicated objects from memory; or when they reproduce designs that are meaningless to them or above the level of perceptual maturity they have attained. The child too young to copy a square makes a circle, one a little older substitutes a square or rectangle for a diamond. A square may be substituted for a rectangle; instead of making a square or diamond as directed the child may make a cross or an *H* and say that he is drawing "a bed" or a "windmill." Locomotives are shown as strings of sausages.

A five-year-old of average ability, when asked to copy a square, made a rude triangle, looked at it and then at the square, saying, "*It's a triangle,*" but he made no attempt to correct the drawing for apparently he saw nothing wrong about it. When a little girl of three was asked to copy Figure 1 she copied it as in Figure 2 saying, "*It's a Christmas tree.*"

The Dionne Quintuplets, when nearing five years of age, drew pictures of their bird houses as shown in Figure 3. The bird houses about their nursery which furnished the inspiration for this effort are the shape shown in the lower right figure. The response the quints made was typical for their age, and illustrates the tendency of young children to reduce difficult objects to simpler or more familiar forms.

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Figure 1.



Figure 2.

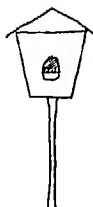
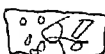


Figure 3.

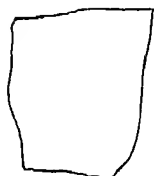


Figure 4.

CHART 1

FIGURES 1-4

Figure 3 consists of birdhouse drawings done by the Dionne quintuplets, and is reproduced from the *New York Times Magazine*, May 28, 1939, with the permission of Mrs. Eunice Fuller Barnard and the publishers of the *New York Times*. Figure 4 consists of reproductions of the Binet diamond.

The difficulties that children below the requisite mental age experience in reproducing the Binet Diamond are well known to every Binet examiner. Figure 4 shows the diamond to be reproduced and six attempts made by children five and six years old, to copy it. The tendency of some children to "put the ears on" is shown in the lower left drawing.

In an earlier article (4) the writer demonstrated the operation of this difficulty reduction tendency in problem solving generally, whether in the field of reading, reproducing material perceived orally, in thinking and reasoning. When a child says, "*I pledge a legion to the flag*" instead of "allegiance" he is illustrating the same tendency. A child reported enthusi-

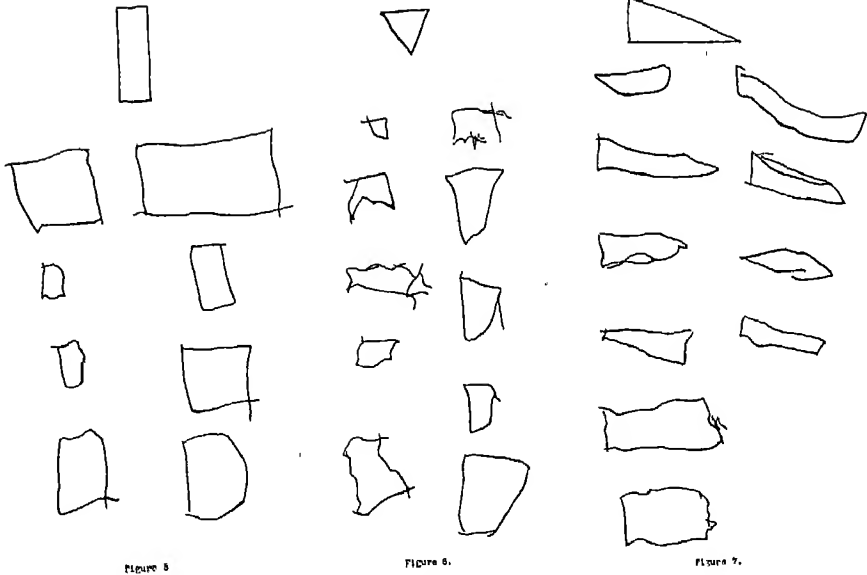


CHART 2
FIGURES 5-7

astically to her teacher that she had learned where the hen lays eggs. *"It's on an average."* *"Where?"* asked the surprised teacher. *"On an average. Right here in this book it says: 'A hen lays six eggs a week on an average.'"* A certain author complained that it seemed impossible for any proofreader to leave the word "windrow" alone as it stood in his original text, so universal was the tendency to substitute the word "window."

DIFFICULTY REDUCTION IN COPYING FIGURES

In order to obtain more systematic evidence of the operation of this principle in children's perception shown in reproducing figures, a figure-copying experiment was carried on with four-year-old children ranking above the average in general intelligence, all of whom were attending a private school.

The figures to be copied were mimeographed on large sheets of paper; the children were given large crayons and were asked to copy the drawings. None of the children said, "I can't" or refused to draw. The younger the children, the more tendency toward "error" was shown, and the farther removed the reproductions were from the originals.

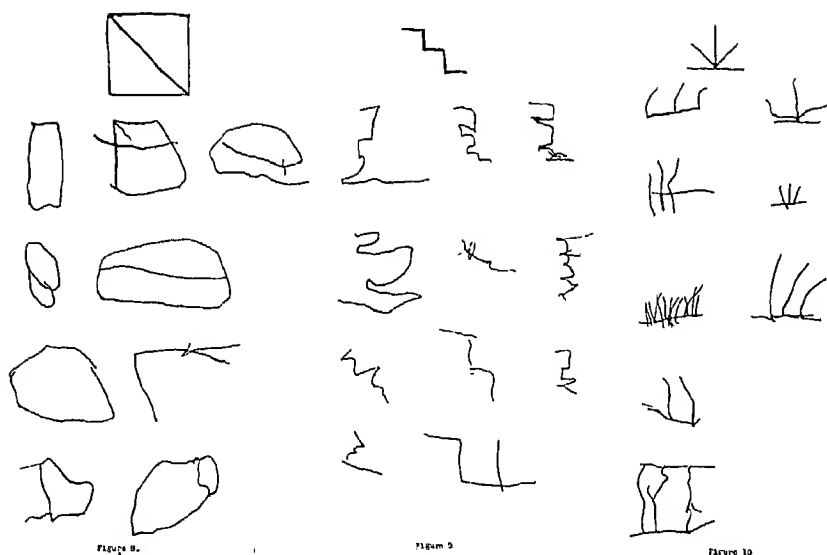


CHART 3
FIGURES 8-10

The results are shown in Figures 5 to 10. At the top of the reproductions stands the original figure to be copied in each case.

CONCLUSIONS

These results prove that young children, in attempting to reproduce designs, tend when the design is too difficult to reproduce correctly, to simplify the drawing according to certain principles. The tendencies are: to substitute something that is meaningful for a meaningless design, or that is lower in the evolutionary series for maturation in drawing; to unify and to "close" the design, to introduce rhythm, symmetry, or conventional proportions when these are lacking. There is a tendency to "square" anything with angles, to shorten a rectangle, to substitute a circle for any design suggesting roundness, to make diagonals vertical or horizontal, to widen angles, to simplify the design all over by omitting detail. The tendency is toward more primitive and habituated responses, resulting in mental economy and least effort. What has been previously learned tends to persist; change is resisted. The child confronted with a difficult problem, instead of turning away from it, unconsciously remakes the problem to fit his immature

mentality. He reworks the concept to fit his grasp, getting out of it only what his limited insight and experience permit. This appears to be a law of childish perception, of thinking and problem solving.

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BOOKS

The Journal of Genetic Psychology, the *Journal of General Psychology*, and the *Journal of Social Psychology*, will buy competent reviews at not less than \$2 per printed page and not more than \$3 per printed page, but not more than \$15.00 for a single review.

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CRITICAL REVIEWS OF RECENT BOOKS

The Journal of Genetic Psychology, 1944, **64**, 337-343.

(Tolman, E. C. *Drives Toward War*. New York: D. Appleton-Century, 1942.)

REVIEWED BY A. M. OLSEN

"War is horror, cruelty, death; but it is also selflessness, devotion, exaltation. One stands confounded before such a contradictory, terrifying, yet (to many minds) glorious human adventure." This statement serves as introduction to Tolman's foreword in his recent booklet on the psychology of war. One begins to read with the high hope that a psychologist of renown will clear away the confusion before "such a contradictory, terrifying, yet (to many minds) glorious human adventure." A study of the book, however, reveals certain assumptions and fixations in Professor Tolman's thinking. These consist of faulty generalizations and comparisons, assumed implications, and vagueness of concepts, representing a trend of thought which because of its consistent emphases may be called biologism. Since the biologistic doctrine takes several forms, these may be enumerated and exemplified in detail.

1. Generally, Tolman emphasizes biological factors. This is shown in the following quotations.

The first and the most basic needs of the human being are those which come from the biological drives. Man shares these biological drives with the lower animals. In fact, most of our precise knowledge concerning such drives comes from experiments on rats, monkeys, and chimpanzees (p. 9).

In his list of appetites "shared" by human beings and animals Tolman includes play and the aesthetic drive. Even here his penchant for biologistic explanations leads to the following statement: "It appears that each is set in motion by some peculiar internal metabolic condition (hunger, thirst, sex, need for exercise, etc.)" (p. 20).

It is to be noted, further, that it is largely due to Kohler's pioneer studies with chimpanzees plus the more recent and more controlled studies under Yerkes' direction at the "Yale Laboratories of Primate

Biology," that we now have clear notions concerning these instrumental social techniques (p. 27).

The table of contents itself shows the biologistic stress. Chapter II is called "The Biological Drives"; Chapter III is called "The Social Techniques." One sees immediately the possibility for two additional chapters, left unwritten by Tolman, on "The Biological Techniques" and "The Social Drives."

2. The essentials of the Freudian doctrine are accepted by Tolman.

It was Freud who first uncovered most of these mechanisms (p. 60). (Psychological mechanisms are referred to here.)

It was the discovery of the fact of repression which constituted one of Freud's first and major findings (p. 63).

Reaction-formation (also called reversal-formation) is the term used by Freud to designate the mechanism whereby a repressed unconscious propensity comes out in the guise of its opposite (p. 64).

A typical case of symbolization is that in which the analyst or doctor becomes a symbol for the parent. O₁, similarly the Führer acts as a symbol for the father (pp. 65-66).

Here Tolman seems to accept without reserve the Freudian interpretation. One should exercise great caution in offering simple explanations of Der Führer.

"The negative character of the truly frustrating agent gets displaced on to (spreads to) some quite innocent bystander" (p. 67).

The limitations of Freudism have been amply and repeatedly discussed elsewhere. They need not detain us here.

3. A kind of hedonism is implied in Tolman's formulations. Consider the following.

In *fright* the organism runs away from or hides from the injury-threatening situation. And the ultimate drive seems to be to avoid the internal sufferance which we call pain and which would result from the injury (p. 20).

But this does not justify the generalization that all "internal sufferance" is pain. This objection is valid even when we assume a genetic relationship between sensory pain and all other "internal sufferances." Such a genetic relationship does not imply the identity of the two. One could as well say that water and hydrogen are the same thing.

Other examples of Tolman's essentially hedonistic views follow.

Nurturance (giving aid and protection). This seems to be an exten-

sion of the simple maternal drive. It is observed in the higher animals such as the chimpanzee (and man). It is the propensity of an older or stronger animal to aid, or give protection to, a weaker one. The following is quoted from Köhler's classical account of the chimpanzee.

"... One day when he seemed a little better, the little fellow was once more let out into the open, where the others were gaily eating green stuff. He dragged himself painfully to them, but after taking a few steps he suddenly fell to the ground with a piercing cry of fear. Teicera was sitting some way away, chewing. She sprang up, her hair standing on end all over her body with excitement. She reached him in a few strides, on two legs, her face filled with the utmost concern, her lips protruding with sorrow, and uttering cries of distress; she caught hold of him under the arms, and did her best to raise him."

"It is evident," says Tolman, "that such nurturance gives some sort of satisfaction to the older animal" (pp. 14-15).

It is just as evident that all behavior gives some sort of satisfaction. The unwarranted generalization that all behavior is motivated by simple, definable rewards is the essential error inherent in hedonism. Hedonistic doctrines obliterate the distinction between self-seeking and self-sacrifice. All desires, purposes, and aims are the same. Individual differences do not really exist. Cultural differences are negligible. Social evolution leaves untouched the "real" motives of human beings. The coward and the hero have the same motivation—for Tolman. The truth of the matter is that the common element in all of the highly contrasting modes of behavior of any two organisms, or in any two disparate episodes in the life history of a single organism, is not much more than that they are (necessarily) performed by organisms. The search for constant and permanent motivating forces thus leads to the striking conclusion that the organism always participates in the accomplishment of its own activities. But of this only animists have doubts.

Tolman espouses ethical as well as psychological hedonism. "In the last analysis, it can be said that all the things we human beings do and want are ultimately to be evaluated with respect to the degree to which they tend to satisfy hunger, thirst, sex, and the rest, or to prevent pain, frustration, and loneliness" (p. 23).

4. Tolman wishes to rehabilitate the doctrine of instincts.

Men, we must assume, are endowed by nature with hunger, thirst, sex, etc., and also with considerable propensities toward self-assertion, self-abasement, collectivity, and collective assertion. Or (to use a somewhat outmoded phraseology) we must suppose that the biological drives

and all the four types of social technique are all rooted, to some degree, in instinct (p. 56).

The only difficulty seems to be that even in man the innate propensity toward such collective techniques seems somewhat weak whereas the innate propensity toward the opposed self-assertive techniques seems relatively strong (p. 47).

Even under the scrutiny of so keen a seer as Professor Tolman man retains his original sin. At any rate—it seems to Tolman—his innate meanness is “relatively strong.” But, take heart, this is the “only difficulty.”

At times Tolman's instinctive bias results in self-contradictions. Under the heading of Collective Techniques he writes the following:

Imitation. Imitation is a very fundamental propensity in social animals. Even white rats, as has been recently demonstrated by Miller and Dollard, can be *taught* to imitate one another, in so far as following along a given path is concerned; and in the higher animals such as monkeys and chimpanzees (and human beings) this imitative tendency may become very strong (p. 41). (*Italics by reviewer.*)

5. Tolman's essay breathes zoömorphism. The neglect of this concept in psychological literature is striking in view of the stress given the idea of anthropomorphism. This does not justify Tolman, however. Both zoömorphism and anthropomorphism are errors arising from failure to see the *differences* as well as the similarities between animals and human beings. The following quotations express or imply zoömorphic evaluations.

“The first and most basic needs of the human being are those which come from the biological drives. Man shares these biological drives with the lower animals” (p. 9). As one of the drives which man “shares” with the lower animals Tolman names “elimination drives (urination and defecation in specific types of locale)” (p. 10).

Another drive “shared” by animals and human beings is nest-building and nest-using. “A just parturient or post-parturient female rat (or any rat—male or female—kept at a low temperature) will build a nest from paper strips, if provided with such strips. When the nest is finished,” etc. (p. 16).

Misleading zoömorphic implications are contained in the following quotations. “The concept of dominance-status arose from the observation that in any group of two or more individuals of a gregarious species there is a tendency for each animal to try to achieve dominance over others in respect to limited supplies of food, sexual partners, or the like; and this leads to the establishment of a dominance-hierarchy within the group” (pp. 29-30).

"Tom, a male weighing 24.4 kgs.; Dick, a male weighing 19.5 kgs.; Don, the male castrate 18.6 kgs.; and lastly Gamma, a female weighing 20.9 kgs. They fell into a linear series from the most dominant to the least dominant" (pp. 31-32). In acquainting us with this fact, precisely what does Tolman wish to say *about human society*?

"Competitive acquisition. Under this heading I refer to the technique (when there is limited food supply) wherein each animal tries to grab as much as possible for himself, more indeed than he can actually eat then and there" (p. 32). This is an interesting, though ordinary barnyard observation. Does Tolman believe that calling this behavior "competitive acquisition" illuminates real (war-evoking) "competitive acquisition"—such as economic monopolies?

Tolman makes anthropomorphic errors as well. One or two examples will suffice. Play and aesthetic drives are included in the list of drives shared by animals and men. However one may qualify this view and whatever apologies one may make for our brute brothers, they lack a true counterpart of human art, though we may fully grant, of course, that art may have had its evolutionary origin in animal life.

Tolman quotes Köhler as follows: "It is strange how convincing, one might say full of moral indignation, this howling of the attacking group [of chimpanzees] sounds to the ears of man . . ." (p. 48).

Zoomorphic and anthropomorphic errors are inexcusable in a student of comparative psychology, for strictly speaking it devolves on this branch of psychology to discover wherein and to what extent human beings and animals are alike and wherein and to what extent they differ.

All of the above material confirms Tolman's biologism. In addition he makes other errors, less easily characterized by a single designation, but nonetheless important. The remainder of this review will mention some of these.

Characteristic of Tolman's logical devices is petition of principle. He proves by declaration. "Finally, taken together, it is the appetites plus the aversions which, I declare, provide the ultimate and basic needs for all animals, human and sub-human (p. 23). (Does Tolman find it necessary to make grandiose affirmations?)

There are numerous passages in this vein. For example, "I prefer the term 'social techniques' to that of 'social drives' because the former emphasizes the essentially instrumental, or ancillary, character of the social re-

sponse" (p. 27). But it is precisely the instrumental, or ancillary, character of the social drives which he is trying to establish.

"It was Freud who first uncovered most of these dynamisms. They, like learning, serve as mechanisms or 'channels' whereby the values of the more basic drives or techniques get carried over and lend value to other more ancillary techniques" (p. 60). Begging the question is circuitous and fruitless.

A number of passages concerning the developmental relationship between the organism and the person reveal that Tolman confuses biological, psychological, and social categories. The italicized words in the following statements could not be used more deceptively. (Italics by reviewer.)

"The *beginnings* of these drives [the play and aesthetic drives], as we know them in man, are probably not to be found in the rat, but they certainly are to be found in the chimpanzee" (p. 18).

"Köhler also presents an account of a *primitive* sort of painting [in chimpanzees]" (p. 19).

"In fright the organism runs away or hides from the injury-threatening situation, and the *ultimate* drive seems to be to avoid the internal suffering which we call pain and which would result from the injury" (p. 20).

"Man's houses and heating systems, his clothes, airplanes, governments, crimes, religions, and bombs are, we must assume, to be *ultimately* explained as *but complicated outgrowths* of those same biological drives and social techniques which have been demonstrated in the rat, the chimpanzee, the monkey or the hen" (p. 54).

"In short, training does change 'human nature' to a *surprising* degree. The sadistic and cruel young Nazis have, we must suppose, been *primarily* made and not born" (p. 57).

"Nurturance (giving aid and protection). This seems to be an *extension* of the simple maternal drive" (p. 14).

"In the last analysis, it can be said that all the things we human beings do and want are *ultimately* to be evaluated with respect to the degree to which they tend to satisfy hunger, thirst, sex, and the rest, or to prevent pain, frustration, and loneliness" (p. 23).

Two errors are implicit in the above formulations. First, the outcome of growth and development is identified with, and thereby confused with, its origins; second, the outcome of growth and development is reduced to its origins. It is as if one should say that poetic expression is a surprising development of, or is merely a complicated outgrowth of, or is, ultimately, in the last analysis the mere extension of the babbling of infancy. Such a view is reductive; it denies real growth and evolution.

Tolman's capital error is found in his "understanding" of nazism and fascism. He says:

For, different societies can be usefully characterized by their specific emphases with respect to these four subgroupings of drive or technique. Thus, some are to be characterized as emphasizing primarily the self-assertive techniques in their leaders but the self-abasive techniques in their masses (that is, the Nazi and Fascist societies); others as emphasizing, rather, a more even spread of self-assertive techniques throughout the whole population (that is, the democratic societies); others as emphasizing a relatively high development of collective techniques in all individuals (that is, the socialistic societies) (p. 29).

The conception of fascism as an "emphasis on the self-assertive techniques of a minority and the self-abasive techniques of the majority" is a most deplorable error. It is also the least excusable of Tolman's errors; for it is an expression of his social thought and it rests upon the most obvious logical flaw. He defines submission as "the technique of the animal which accepts the domination of another" (p. 37). But this "definition" does not express a genuine concept; it merely juxtaposes contradictory terms. The most that this phrase can mean is *the technique of an animal that accepts that which is unacceptable, or that desires to be coerced*. A brief consultation of any good dictionary of the English language would have obviated this elementary error. That Tolman is unaware of some such necessary distinction as voluntary submission and submission by coercion is clearly evident throughout the book. For example, he writes persistently as though all abasement (submission) were self-abasement. It is, to him, a "technique" which has "instrumental" or "ancillary" value. Also, his example for illustrating self-abasement (in general) is an instance of voluntary, rather than coerced, submission: Jack was in no way coerced to grant Josie control of the food (p. 38). Finally, concealing by an inept term the distinction between voluntary submission and coercion Tolman allows himself to see in the humiliation of human beings under fascism nothing more than the innate propensity to self-abasement.

The following words of Professor Tolman are, perhaps, the most memorable:

Knowing but little sociology, economics, history, or political science, I, as a mere psychologist, will adapt concepts derived from the behavior of rats and chimpanzees, combine them with certain Freudian notions, and then attempt to apply the result to the central and the most grievous problems of human society (p. xii).

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BOOKS RECENTLY RECEIVED

(There will always be two pages of book titles, listed in the order of receipt, i.e., the most recently received books will be found at the end of the list.)

- SCIENCE, PHILOSOPHY, AND RELIGION (THIRD SYMPOSIUM). New York: Conference on Science, Philosophy, and Religion, 1943. Pp. 438.
- Addresses Delivered at the University of Wisconsin in Celebration of the Centenary of the Birth of William James. Madison: Univ. Wisconsin Press, 1942. Pp. 147.
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- CHUBB, I. L. Italian or American? The Second Generation in Conflict. New Haven: Yale Univ. Press, 1943. Pp. 208.
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- SRINIVAS, M. N. Marriage and Family in Mysore. Bombay: New Book, 1942. Pp. 219.
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- JENNINGS, H. H. Leadership and Isolation. New York: Longmans, 1943. Pp. 240.
- LEE, A. M., & HUMPHREY, N. D. Race Riot. New York: Dryden, 1943. Pp. 143.

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